Maastricht University
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Comparison of the performance of Islamic, SRI and Green mutual funds

Master thesis

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Abstract

This paper measures and compares performance of Islamic, SRI and Green mutual equity funds worldwide in the period from 1 January 2001 to 31 December 2015. The sample consists of 611 mutual equity funds and their performance was assessed by using traditional risk-adjusted measures, namely Sharpe ratio, Modified Sharpe Ratio, Adjusted Sharpe Ratio, Treynor measure, Information ratio and Jensen's alpha. The main findings show that Green mutual equity funds, on average, outperform both SRI and Islamic mutual equity funds over the entire observed period. SRI and Islamic mutual equity funds show similar performance, with a slight outperformance of SRI mutual fund for the majority of measures. Omission of the financial crisis of 2007 – 2008 and dot.com crisis in 2001 observations from the sample period reduces the differences in the performance between SRI and Islamic mutual equity funds. The Green mutual equity funds still remain the best performing ones. While there is an economic significance as presented in this thesis, there is no statistical significance as can be seen from t-test results.

Key Words

Islamic mutual funds, SRI mutual funds, Green mutual funds, performance comparison, ethical investment, Sharpe ratio, Jensen's alpha, Information ratio, Treynor measure, risk-adjusted performance

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1. Introduction

Nowadays, the Islamic, SRI and Green investments represent one of the drivers in the 'modern' ways of investing. The investors' social and ecological awareness has risen and consequently translated into increased amount of assets invested in the Green and the SRI financial products. As a consequence, Green and SRI mutual equity funds grew significantly. Similarly, in the past two decades, the Islamic mutual equity funds grew considerably as Shariah scholars started to accept equity investments. Moreover, they have been increasingly incorporated into global financial markets, as they offer innovative financial products and opportunity for investors to diversify their portfolios, thus potentially offsetting their risk.

The Islamic, SRI and Green mutual equity fund managers use screening when choosing which stocks to include into their portfolios. Since they all funds have nature of ethical investment, it makes interesting to study and compare their performance. The objective of this is to examine and compare performance of the Islamic, SRI and Green mutual equity funds in the period from 1st January 2001 to 31st December 2015. Moreover, the additional objective is to observe whether the performance differs if the period of the major financial crises, i.e. dot.com bubble in 2001 and financial crisis 2007-2008 is excluded from the observation period. This thesis contributes to other financial literature by being the first study, up to the author's knowledge, as it compares and considers the performance of all three types of funds together.

The results illustrate the differences in fund's performance which was measured by using different traditional, risk-adjusted performance measures, namely absolute and relative performance measures. Relative performance measures considered are Sharpe ratio, Modified Sharpe Ratio, Adjusted Sharpe Ratio and Treynor measure, while the Information ratio and Jensen's alpha represent the absolute ones.

1.1. Academic motivation

The academic motivation for this thesis is to fill in the missing gaps in the existing literature by conducting the first study on the comparison of the performance of Islamic, SRI and Green mutual equity funds. So far, this topic has been rather poorly examined, with limited amount of research made on either comparing the performance of Islamic or SRI mutual funds or of SRI and Green mutual funds. Therefore, the link between all three types of funds is missing and is aimed to be made in this thesis. Usually, these types of funds are compared to their

conventional counterparts. The reason why this thesis aims to only compare differences in the performance of these particular three types of mutual equity funds is that their investment universe is limited, and therefore, they are subjects of interest of specific investor types, i.e. those who might benefit from this research. Moreover, additional academic motivation is to gain a global perspective on the performance of such funds, as most of the written studies so far have focused on a particular geographic area, for example, already developed Islamic financial markets, such as Saudi Arabia. As all three types of funds exhibit different degrees of presence from one geographic area to another, a global view will allow for unbiased results, eliminating the potential iniquitousness by choosing a particular geographic area in which one type of abovementioned funds dominates the asset management market.

1.2. Contribution

Key potential beneficiaries of this thesis are several agents in the financial industry, namely institutional investors, such as pension funds, and individual investors willing to diversify their portfolios. First and foremost, pension fund managers have changed their investment strategy in recent years in a way that they allocate larger portions of their portfolios to SRI and Green investments. In a similar manner, if the study shows that there is no significant performance difference of the SRI and Green mutual equity funds in comparison to Islamic funds, or that Islamic mutual equity funds outperform the other two types of funds, this study can serve as guidance for the pension fund managers to embrace the idea of including Islamic mutual funds in their portfolio. These types of changes are important for their diversification purposes, however, are conditional on the regulatory environment of different geographical areas. Individual investors can benefit from this study in the same manner as the aforementioned agents, i.e. this study can encourage them to include Islamic mutual funds, SRI or Green in their own portfolios.

1.3. Outline of the thesis

This thesis comprises of seven main parts, briefly explained hereunder. Section 1 introduces the reader to the topic of this thesis, and elaborates on author's motivation and contribution of this paper.

Section 2 provides an overview of the most relevant literature. Firstly, it provides an insight into emergence and objectives of Islamic financial investment, explains Islamic religious

bounds and screens to which investors are faced when making an investment, and shortly points out the growth of this asset type in recent years. Secondly, SRI investment is presented, its key elements and the recent growth, along with the screens an investor needs to take to comply with SRI principles. Thirdly, Green funds are introduced as a subgroup of SRI mutual funds. Further, the differences and similarities between all three types of funds are summarized. Lastly, some of the most relevant research on the performance comparisons between Islamic and SRI mutual funds as well as SRI and Green mutual funds are outlined.

Proceeding to the quantitative part of the research, Section 3 introduces the main research hypothesis, and points to several a-priori expectations made by the author. Further, section 4 presents the methodology used in this thesis and justifies the rationale behind the use of this particular methodology. Section 5 gives and overview of the data. Section 6 presents and comments on the main results. The thesis concludes with section 7, in which main conclusions, limitations and finishing remarks are presented.

2. Literature review

Islamic, SRI and Green investment have one common characteristic, being that all three types of investments are considered to be ethical to the certain extent. Nevertheless, investments can be considered ethical based on different factors and therefore, it is interesting to examine the differences and similarities in the definition, criteria, growth and performance of each type of fund considered in this thesis. In order to do so, first, each individual type of investment will be described, and afterwards, compared.

2.1. Islamic investment and Islamic funds

2.1.1. A definition of an Islamic investment

Some types of investors do not seek only returns when making their investment decision, but they also take into consideration those investments which are labelled as ethical. Usually, SRI investments are the first to come to mind when one mentions ethical investments. Another type of investment also considered to be to a certain degree ethical is Islamic investment. It emerged due to Muslims being unable to invest their assets in conventional finance products, as they do not comply with the religious principles of Islam. For an investment to be characterized as Islamic, it needs to be Shariah complaint, i.e. adhere to Islamic law, which is based on the written interpretation of Qur'an[1] and Sunnah[2]. Moreover, the investment also needs to be aligned with Fiqh, Islamic jurisprudence.

Hence, several core principles of Islamic investment, namely Riba, Maysir and Gharar, are derived from Shariah and Fiqh. Riba is used interchangeably with interest, but encompasses more than just interest. Warde (2000) states that Riba: "usually refers to any unlawful or undeserved gain derived from quantitative inequality or the counter-values. Interest or usury (that is, reimbursing more than the principal advanced) would be then only one form of Riba. Imposition of late fees would be an example of non interest Riba". Maysir refers to gambling (lottery, casino, betting on car races, etc.), and basically forbids investor to take any excessive risk. The rationale behind the principle of Maysir is that it is not socially acceptable for one person to gain wealth, as this might be achieved through harming another person. In a like

[1] Central religious text of Islam
[2] Verbally transmited sayings,teachings and actions of the Prophet Muhammad

manner, Gharar limits Islamic investors from investing into any activities that bring or might bring hazard and risk.

In addition to the aforementioned limitations, it is strictly prohibited for Islamic investors to allocate part of their assets into haram[3] industries, namely the ones related to pork, alcohol, pornography, gambling, and other.

2.1.2. Islamic funds and their growth

Islamic assets can be divided into several investment categories, namely: deposits and short-term money instruments, Islamic funds and Sukuk[4] , Takaful[5] & other equity products (Ali, 2008). One of the fastest growing segments within the Islamic financial industry are Islamic mutual funds, which emerged in 1990s, when Shariah scholars started to accept equity investments. More precisely, in 1994, Islamic investors were for the first time allowed to make transactions in international stocks (Hayat and Kraeussl, 2011). Islamic mutual funds invest in companies which are Shariah compliant, undergoing strict screening, further explained in Section 2.1.3. below.

In the recent release of the Global Asset Management Outlook Report by Thomson Reuters, it is reported that in 2015 Islamic funds represented a $60 USD billion industry, and are expected to grow to at least $77 billion USD by 2019, while the demand for them is projected to reach $185 billion by 2019. Here, it can be noticed that s supply – demand gap exists, meaning that the market is seeking to invest more assets than currently possible, which shows how well Islamic funds are perceived by investors. Another interesting fact is that despite the financial crisis, Arab Spring and Euro crisis, there is still common belief that performance of Islamic funds has remained the same or even exceeded expectations. Following the same reasoning, asset managers remain investing in Islamic funds.

2.1.3. Screening process for Islamic mutual funds

As Islamic investment experiences several limitations and restrictions one has to consider, Islamic mutual fund managers need to carefully screen the companies before including them into their portfolios. In order to decide which companies to include or exclude from their

[3] forbidden
[4] Islamic equivalent for a bond
[5] Islamic equivalent for na insurance

investment universe, investment fund managers use screening. Screening refers to the process which allows investor to make an investment into companies or an asset which meet several criteria. In the case of Islamic mutual funds, qualitative and quantitative screens are used.

Qualitative screening assumes excluding companies based on whether they invest in haram activities. For example, if a company is included in the production or selling of alcoholic beverages, it is strictly forbidden for an Islamic mutual fund manager to include it in his/her portfolio. After the company is screened based on qualitative criteria, quantitative screening takes place. Quantitative screening includes screening based on financial criteria, such as debt, receivables, cash or similar. Whilst qualitative screening is widely accepted and the list of forbidden industries is unified amongst Shariah scholars, there is still no common agreement on how to quantitatively screen stocks and decide whether they are Shariah compliant or not (Derigs and Marzban, 2008). Thus, Islamic fund managers have the liberty to decide which quantitative screens they will use when they are considering new stocks to include in their portfolios.

For the purpose of this thesis, Dow Jones Islamic World index will be used as a benchmark for Islamic mutual equity funds, and thus further presented hereunder. Therefore, Exhibit 1: Screens used for Islamic investments shows two screening categories used to pick the stock to be included in the Dow Jones Islamic World index.

Industry screens	Financial Ratios screens

• Alcohol
• Pork-related products
• Conventional financial services
• Entertainment
• Tobacco
• Weapons and defense
	• All of the following must be less than 33%:
	  • Total debt divided by trailing 24-month average market capitalization
	  • The sum of a company's cash and interest-bearing securities divided by trailing 24-month average market capitalization
	• Accounts receivables divided by trailing 24-month average market capitalization

Exhibit 1: Screens used for Islamic investments

Source: Dow Jones

Industry screens are the qualitative screens mentioned above, and they are related to making investments in stock operating in certain industries. Financial ratio screens represent

quantitative screens, and if the company's financial indicators are not below 1/3 of the following indicators, it will be automatically prohibited to invest in it.

2.2. Socially responsible investing and socially responsible mutual funds

2.2.1. A definition of an SRI investment

Sparkes (2008) defines socially responsible investing as "an investment discipline that adds concerns about social or environmental issues to the normal ones of risk and return as determinants of equity portfolio construction or activity." Sparks also mentions three distinctive techniques or SRI, namely: exclusion, activism and dialogue or engagement. Exclusion refers to the avoidance of investing in stocks of a company whose activities and products are considered unethical and potentially harmful to the society. Activism assumes the opportunity for the owners of the company's stocks to address and point out to any action which might be characterized as unethical, and more commonly, to use the right as an investor and shareholder to promote and push for social goals within the company.

In a similar manner, Laurence (2013) explains SRI investment as an investment which incorporates criteria that goes beyond the conventional criteria of using just the potential of the stock to generate extra financial return. Basically, SRI investors value other criteria over pure returns, and are concerned about the impact which the investment, and thus the support they are giving to the company, might have on the environment and on the society. Laurence, like Sparkes, also mentions distinctive techniques of SRI, namely exclusion funds and shareholder activism. Exclusion that Laurence mentions parallels the one of Sparks, and shareholders activism to a certain extent parallels activism, emphasising once again the importance of shareholders vote regarding the SRI issues.

When one talks about SRI, another term, environmental, social and governance (ESG) comes into discussion. Principally, one can say that a short definition of SRI is incorporation of ESG criteria into the investment decision making process in order to generate long term sustainable growth, taking into consideration the impact on society.

2.2.2. SRI mutual funds and their growth

Recent years have shown exponential growth in the amount of assets invested in SRI in general. For example, according to the US SIF Foundation, in the USA, in 2012 total asset under management invested in SRI was USD 3.74 trillion. At the beginning of 2014, it has been reported that total asset under management in SRI is USD 6.57 trillion. Another astonishing fact is that in the period from 1995 up to 2014, total amount of assets invested in SRI increased by 929%, now accounting for USD 1 out of every USD 6 invested in the US, as shown in Exhibit 2: Sustainable and Responsible Investing in United States 1995-2014 (USD in trillions)

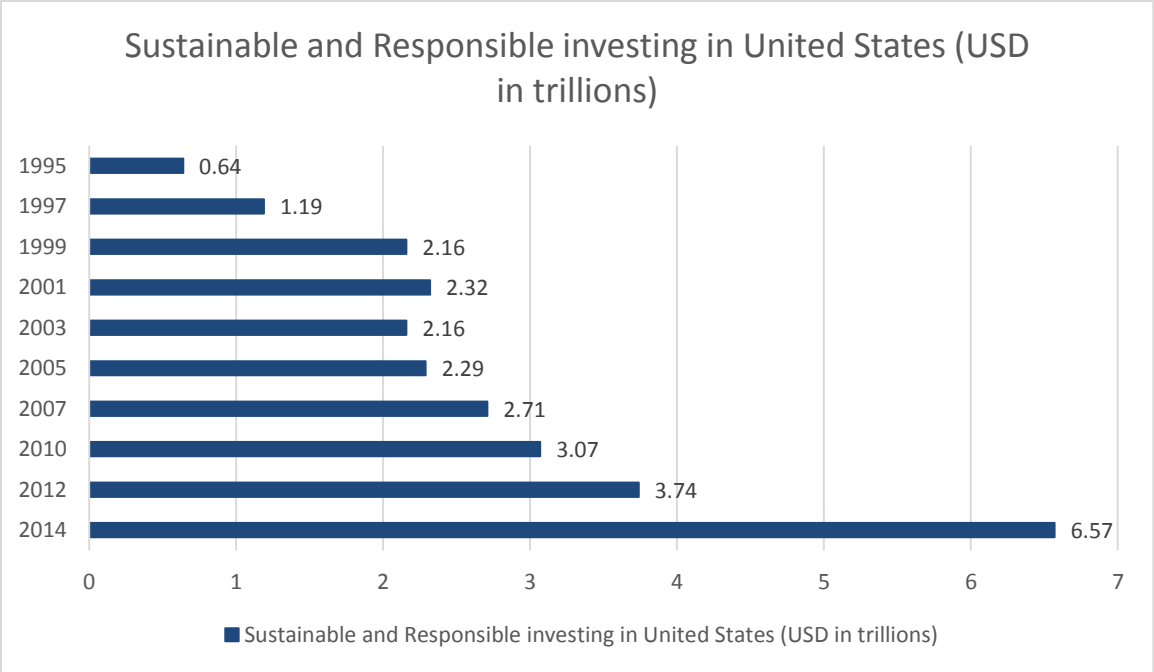

Exhibit 2: Sustainable and Responsible Investing in United States 1995-2014 (USD in trillions)
Source: US SIF Foundation, Report on US Sustainable, Responsible and Impact Investing Trends 2014

Socially responsible mutual funds have been growing at a similar pace as the overall SRI investment. One group of investors, namely institutional investors, such as pension funds, have recognised their potential, and are massively incorporating ESG criteria in their investment decisions. The regulation imposed by the governments worldwide on screens and risk pension funds is allowed to take on, made pension funds one of the most well-known "users" of SRI investment. Besides pension funds, more and more individual investors are

willing to allocate part of their assets in such funds, following the market trends of sustainability and social awareness. Therefore, socially responsible mutual funds are a trending topic nowadays, and are expected to continue to grow in size in the years to come.

	1995	1997	1999	2001	2003	2005	2007	2010	2012	2014	2016
Number of Funds	55	144	168	181	200	201	260	493	720	894	1002
Total Net Assets (in Billions)	$12	$96	$154	$136	$151	$179	$202	$569	$1,013	$2,457	$2,597

Exhibit 3: Investment Funds Incorporating ESG Factors 1995 – 2016

Source: US SIF Foundation, Report on US Sustainable, Responsible and Impact Investing Trends 2016 (Note: "ESG funds include mutual funds, variable annuity funds, closed-end funds, exchange-traded funds, alternative investment funds and other pooled products, but exclude separate accounts, Other/Not Listed, and community investing institutions. From 1995-2012, separate account assets were included in this data series, but have been excluded since 2014, in order to focus exclusively on commingled investment products, Source: US SIF")

Taking a closer look at the Exhibit 3: Investment Funds Incorporating ESG Factors 1995 – 2016, one can see that since 1995, the amount of assets invested in SRI funds has grown in every period presented. The amount of funds characterized as SRI has also been growing steadily as can be seen in every period outlined.

2.2.3. Screening process for SRI mutual funds

SRI mutual fund managers, like Islamic mutual fund managers, need to take into account several screens when making their investment decisions. One of the widely accepted and used screens are the ones employed by the US Forum for Sustainable and Responsible investment, which uses 14 screens when screening SRI investment, presented as Exhibit 4: Screens used for the SRI Investment.

Environment	Social	Governance	Products	Other
• Climate/Clean Tech • Pollution/toxics • Environmental/other	• Community development • Diversity & EEO • Human Rights • Labor relations • Sudan	• Board issues • Executive pay	• Alcohol • Animal welfare • Defense /weapons • Gambling • Tobacco	• Oher / Qualitative • Shareholder engagement

Exhibit 4: Screens used for the SRI Investment

Source: US Forum for Sustainable and Responsible Investment

US Forum for Sustainable and Responsible Investment reports four main categories based on which stocks are screened, namely environmental, social, governance and products. On the top of them, two unclassified categories are called other/qualitative and shareholder engagement.

SRI stocks are screened using positive and negative screening. The main idea behind positive screening is to include those companies characterized as positively screened according to the same criteria. If one takes abovementioned criteria from Exhibit 4: Screens used for the SRI Investment, a positive screen would be investing in companies which have a net positive climate and/or pollution impact on the environment. Additionally, positive screening may refer to the inclusion of those companies which are in any way promoting best practice and acting in a sustainable manner. On the other side, negative screening, also often called avoidance, refers to the exclusion of companies that are in any way included in acting in non-sustainable way. For instance, companies which are selling and/or manufacturing weapons, alcohol, promoting gambling or any other similar products/activities would be excluded from the portfolio of an investor who is concerned with negative screens. Basically, negative screening means excluding investing in "sin-stocks". Although positive and negative screening represents two opposing techniques, they are best used interchangeably, thus, yielding optimal allocation of resources invested in carefully selected assets.

The European Social Investment Forum, a non-profit organization focusing on SRI investments, presented positive and negative screening into more detail, introducing one particular type for each. When it comes to positive screening, there is a type of positive screening called best-in-class screening, which is dedicated to investing in leading companies fighting the SRI issues. The type of negative screen mentioned is norm-based screening, which is dedicated to exclude not only companies which are investing into sin stocks, but also ones that are violating some set norms and conventions, for example, the United Nations Universal Declaration of Human Rights, UNICEF Convention on the Rights of the Child, and the ILO Labour Standards.

The European Social Investment Forum defines another type of screening, called engagement. They define engagement as follows: "Engagement is a method for fund managers to educate and influence their holdings' SRI practices. This is usually done via a direct dialogue with the company or by using their shareholder votes." Basically, this type of screening follows the same rational of Sparks (2008) and Laurence (2013).

2.3. Green investing and Green mutual funds

2.3.1. A definition of an Green investment

Following the development and wide acceptance of socially responsible investing, another similar type of investment appeared, namely Green investment. Green investment can, most broadly, be defined as an incorporation of concerns about environment into business decision making. Thus, it can span from making a direct environmentally conscious decision such as gaining a particular certificate for sustainable investment, all the way to founding and managing Green investment funds. However, a single definition of Green investment has still not been agreed upon. Eyraud et al. (2011) define Green investment as "investment necessary to reduce Greenhouse gas and air pollutant emissions, without significantly reducing the production and consumption of non-energy goods".

With the appearance of Green investment, scholars were faced with another vivid discussion, and that is whether Green investment actually differs from the socially responsible one, or can SRI and Green investment be used interchangeably. Scott (2013) refers to a Green investment as a subcategory of social investment. Similarly, Kelly (2010) argues that Green investment represents one of the forms of the socially responsible investing, but in their core there is not much difference. Hence, both authors point out that the main difference between both types of funds is that Green investment is more limited than SRI, as Green investment focuses on environmentally friendly decisions, and excludes companies which have a negative impact on the environment, thus incorporating only environmental criteria from the ESG.

In this thesis, the same rationale will be pursued, categorizing Green mutual funds as a subcategory of SRI mutual funds.

2.3.2. Green funds and their growth

When it comes to Green mutual funds, they can be explained as making an investment decision which has to comply with a particular set of principles, in order to consider the investment as a result of conscious decision. As a subcategory of SRI investment, such screens are somewhat similar to those defined in the previous section on socially responsible investment, yet they are narrower as they do not encompass social and governance ones.

Similarly it was the case with the growth of SRI; remarkable growth has also been achieved by Green investment. One can note that the total number of funds labelled as Green is rather small compared to the total number of funds labelled as SRI, however, which is none of the surprise as they represent a niche of SRI funds.

2.3.3. Screening process for Green mutual funds

According to Mercer (2009), there are three, non-mutually exclusive ways on how to choose whether the stock is considered a Green investment. First is screening and it mirrors the description presented when explaining screening process for SRI mutual funds. The main difference in the screening criteria between SRI and Green funds is that Green funds are more limited, as they encompass only environmental category of the SRI funds, and thus, their mutual fund managers are prone to make restrictive investments. Second, the thematic approach refers to directing the investment on certain sectors, for example on the clean energy sector. Third, engagement refers to building long term relationships which companies which are concerned about sustainability topics.

There are two group of KPI s which can serve as a basis to characterize industry as Green or not, as seen on the Exhibit 5: Common KPIs for environmental screening. First group of KPIs are the general ones applicable to all industry groups. Employing those KPIs means positively screening those companies which are concerned about the efficiency and development of renewable energy sources, and negatively screening those companies which do not employ such practices. Second group of KPIs is specific to a certain sectors and industries. Examples of these include CO2 emissions, waste and environmental compatibility.

	Environmental
General KPIs which apply to all industry groups	E1 Energy Efficiency
	E2 Deployment
Sector-specific KPIs which apply to certain sectors	E3 $CO_{2\ \text{Emissions}}$
	E4 NO, SO Emissions
	E5 Waste
	E6 Environmental Compatibility
	E7 End-of-Lifecycle Impact

Exhibit 5: Common KPIs for environmental screening

Source: Bassen and Kovacs, 2008

For the purpose of this thesis, Nasdaq Green Economy Global Benchmark Index will be used as a benchmark for Green mutual funds, and thus presented hereunder. In order to attribute

Green label to an investment, Nasdaq employs uses positive screens regarding following criteria:

1. Clean Transportation
2. More efficient and cleaner energy production
3. Better water usage and management
4. Greener buildings
5. Clean and efficient waste management
6. Improved land usage through sustainable farming and forestry

2.4. Comparison of Islamic, SRI and Green investing

In this section, qualitative and quantitative differences between each type of fund will be presented. The qualitative comparison will present the differences and similarities between Islamic and SRI investing, and SRI and Green investing, as no research has been made on the combination of Islamic and Green investing. Moreover, quantitative section will point to the differences in performance of Islamic and SRI mutual funds, and SRI and Green mutual funds. Islamic and Green mutual funds will not be compared.

2.4.1. Qualitative comparison

Qualitative comparison of Islamic and SRI investments

According to Bennet and Iqbal (2013), Islamic and SRI investments have been the fastest growing areas in the financial world over the last 20 years. In their core, both types of investment share some common principles, and therefore, it makes them interesting to study together. For instance, the most obvious similarity between them is that they incorporate ethical standards and stock screening. Another similarity is that, in their investment universe, focus is on equity investments rather than on fixed income products.

Further, one of the most prominent studies that that has left an impact on this research area is the one performed by Forte and Miglietta (2011) on a comparison of Islamic and Socially responsible equity investments. In their study, they examined whether Islamic equity investments can be a subcategory of SRI investments or not. In the qualitative part of their research, they compare both types of investments based on several characteristics, such as whether both types of investments use best-in class screening, or whether there are certain

countries in which Islamic and SRI mutual fund managers are not allowed to invest in. Their findings are presented in Exhibit 6: Key characteristics of Islamic and SRI investment hereunder.

	Islamic Funds	Socially Responsible Funds
Clear definition of action limits	Yes, the guide is the Qu'ran integrated when possible by legal interpretations	No. A universally recognized definition of social responsibility
Faith-based rules	Yes	No
Supervisory committee	Yes, *Shari'ab* supervisory board	Not necessary, where present, it is called *Ethical Committee*
Management Strategy:		
▪ *Sector exclusion*	Yes, sectors considered not compliant to the Qu'ran are excluded	Yes. Sectors not compliant with social and environmental criteria excluded
▪ *Best-in-class*	No. There is a general distinction between admissible and prohibited assets (1). The strategy is in-out.	Yes. Firms operating in sectors generally forbidden can be included if they exhibit a commitment to socially responsible principles
▪ *Screens based on environmental filters*	No	Yes
▪ *Screens related to human rights*	No	Yes
▪ *Screens associated with transparent corporate practices*	No	Yes, but not in all cases
▪ *Shareholder advocacy*	Shareholders are encouraged to formally express a negative opinion regarding certain practices	Yes, mostly used in US and Canadian markets
Restriction on investment management	Yes; some financial instruments (e.g. preferred stock) and investment activities are forbidden	No
Financial Screens	Yes. Faith-based filters are applied during the stock selection process. The core principles on which the filters are based relate to leverage, presence of interest of interest-bearing assets and liabilities, high level of debt and credit.	There are on financial parameters that determine the inclusion of an asset in the SRI index. The fund manager will decide which roles ratios or financial characteristics are required to include stock in the managed portfolio

Exhibit 6: Key characteristics of SRI and Islamic investments

Source: Forte and Migglieta, 2011

Forte and Migglieta conclude that there might be some inconsistencies if one decides to use Islamic investment as a subcategory of SRI investment, as key characteristics and restrictions differ from one type of investment to another. For example, SRI investment does not consider any financial ratios in determining whether the investment is SRI or not. On the other hand,

Islamic investment considers multiple financial ratios which have to be met in order for the investment to be characterised as Islamic. Moreover, Islamic investment originates from Islam, and therefore is called faith- based investment, while SRI investment is not based on religious grounds.

2.4.2. Quantitative comparison

Quantitative comparison of Islamic and SRI investment

Forte and Migglieta (2011) found, using a cointegration analysis of FTSE indices, that the Islamic index contains a stochastic trend that cannot be compared with SRI or conventional indices since it is not cointegrated with them. All in all, the authors concluded that although there are some similarities between SRI and Islamic equity investments, they can be perceived as two separate types of investments. Since Islamic and SRI funds are different, the authors also argue that they could be of interest to investors who wish to diversify their portfolios. (Forte and Migglieta, 2011)

Another interesting study is the one by Bukhari and Azam (2015) on the Comparative Returns Performance Review of Islamic Equity Funds with Socially Responsible Equity Funds and the Broader Market Indices. The authors found that, using single-factor capital asset pricing model, both types of funds experience lower risk and same ability to time the market.

Quantitative comparison of SRI and Green investment

Mallet and Michelson (2010) conducted the first study on this topic in which they found out that real performance differences between these two types of funds do not exist. Moreover, they include index funds in their research and reach the same conclusion as authors above. However, when looking at the marginal performance differences, index funds outperform SRI funds. Hence, they conclude that both types of investment, SRI and green, can be attractive for investors who believe that green investing yields favourable risk/return trade-off.

3. Research question, sub-question and a-priori expectations

Main research question

Main research question is as follows:

"Are there any differences in the performances of Islamic mutual equity funds, SRI mutual equity funds and Green mutual equity funds?

Sub-questions

If results prove that difference in performance exists, the author will attempt to answer the following questions:

1) Which type of the mutual equity fund shows better performance characteristics when compared to the remaining two?
2) Is the performance consistent throughout the whole sample period?
3) Are there any differences in the results if the periods of the financial crisis (2007-2008) and the dot.com bubble crisis (2001) are excluded from the sample period?

Firstly, it is interesting to examine whether any type of mutual fund outperforms or underperforms another. For example, if Islamic mutual equity funds potentially outperform SRI mutual equity funds and Green mutual equity funds, it may suggest potential for institutional investors and individual investors seeking to adhere to ethical investment to include them in their portfolios. Secondly, if the performance is not consistent throughout the whole sample period, it is crucial to see whether there are any large drawdowns in the performances, which might have a severe impact on one's portfolio. Lastly, it is interesting to examine whether all three types of fund were severely impacted by the negative market environment during the financial crisis in 2008-2009 and dot.com bubble in 2012, as well as whether the results would change if those observations were excluded from the sample.

A-priori expectations

The author's main expectation is to find differences in the performance of Islamic mutual funds in comparison to SRI and Green funds. The rationale behind this expectation is that all three types of funds have a different investment orientation, and although they are considered to be within the category of investments, which are known to have certain ethical restrictions, their portfolios significantly differ. Moreover, it is expected that non-consistent results will be found throughout the sample period. As financial markets are heavily influenced by the

macroeconomic happenings, it seems only natural that changes in regulation, investment trends and similar will contribute to those differences. Additionally, the author's expectation is that the exclusion of the crises period would contribute to more positive overall results, and that it would not significantly change the order of the best performing and worst performing mutual equity fund.

4. Methodology

Using returns as a performance measure has proven to be insufficient, as it does not take risk into consideration. Therefore, in order to asses and compare performance of Islamic, SRI and Green mutual equity funds, other measures will be used, which are adjusted for risk. These measures point that out of the two assets which have the same return over a certain period of time, the one that will be considered as the better performer is the one less risky one. Hence, all investors would be in favour of this investment.

Historically, several risk adjusted measures have been developed and are now used as traditional measures to evaluate and compare performance. In this thesis, the following measures will be calculated:

1. Sharpe ratio
    a. Sharpe ratio
    b. Adjusted Sharpe ratio
    c. Modified Sharpe ratio
2. Treynor measure
3. Jensen's alpha
4. Information ratio

All of these measures have been developed in the context of Capital Asset Pricing Model (CAPM) and thus, there are several assumptions they have in common. They all assume that:

1) "All investors are averse to risk, and are single period expected utility of terminal wealth maximizers,
2) All investors have identical decision horizons and homogeneous expectations regarding investment opportunities,
3) All investors are able to choose among portfolios solely on the basis of expected returns and variance of returns,
4) All transactions costs and taxes are zero,
5) All assets are infinitely divisible (Simmons, 1998)."

Nonetheless, these measures slightly differ one from another. While the Sharpe and Treynor ratio are considered to be absolute risk- adjusted performance measures, Information ratio and Jensen's alpha are considered to be a relative risk-adjusted performance measure. The reason

why these measures were used as the relevant one to evaluate performance is the existence of numerous researches which employ same metrics to calculate and assess performance of similar investment types. For example, Mansor et al. (2011) use Sharpe, Treynor ratio and Jensen's alpha to evaluate Islamic mutual fund performance in terms of stock selectivity and market timing. Similarly, Hassan and Alhenawi (2010) employ Sharpe, Treynor, Jensen Alpha and the modifications of aforementioned ratios to assess the performance of Islamic versus conventional mutual funds' performance in Saudi Arabia. Luther et al. (1992) were the first to examine the financial performance of SRI funds. To measure the performance, they used the Sharpe ratio and Jensen's alpha. Bell (2013) conducted another study on the performance of socially responsible indices and mutual funds, by using, amongst other measures, Sharpe ratio and Jensen's alpha. In their paper "Do Green mutual funds perform well?", Chang and al. (2012) use Sharpe ratio as one of the measures for evaluating the performance of Green mutual funds.

In the following sections, every measure that will be employed in evaluating portfolio performance will be described more closely, and its mathematical representation will be displayed.

4.1. Sharpe ratio

Sharpe ratio represents a fund's excess return (excess return being defined as one above the risk free rate) per unit of standard deviation. It originated back in 1966, when it was introduced by William Sharpe, and today it serves as one of the broadest performance measurements. At first, Sharpe named this measure "reward-to-variability", however, over time, scholars started adopting the name "Sharpe ratio". (Sharpe, 1994) Nowadays, Sharpe ratio is widely for both research and practical purposes academics and in private sector, by portfolio fund managers, to report on their performance.

It is calculated as follows:

$$\text{Sharpe ratio} = \frac{Rp - Rf}{\sigma}$$

Where,

Where,

R_p – return on a portfolio (return of a mutual fund)

R_f – return on the risk free rate

σ_p – standard deviation of a portfolio

Standard deviation of the portfolio is calculated as

$$\sigma p = \sqrt{\sigma^2}$$

where σ^2 is the variance of the portfolio.

The interpretation of Sharpe ratio is relatively straightforward. The higher the Sharpe ratio, the better the performance, as this means that one has gained more assets per unit of standard deviation, i.e. risk. All in all, investors should be keen on investing in portfolios, or in this case type of funds which present a higher Sharpe ratio, as this ensures greater returns of one fund compared to another. Mainly, it points that the greater returns are not a consequence of monetary incentives of portfolio manager to take on excessive risk in order to be able to report higher returns.

Despite the fact that it is widely used, the Sharpe ratio has been subject to criticism due to its limitations. One of the most known limitations of this measure is that is assumes returns are normally distributed. Due to the fact that the Sharpe ratio is based on a mean-variance framework, it can only be used for returns that are normally distributed or quadratic preferences. For example, if the return distributions are skewed, Sharpe ratio might give results which are not entirely correct. For the purpose of avoiding reporting misleading results, and to deal with problems, such as skewness, kurtosis and fat tails, over time, several adjustments to the Sharpe ratio have been developed, which will be described in the two following sub-sections.

4.1.1. Adjusted Sharpe ratio

Adjusted Sharpe ratio, developed by Pezier and White (2006), takes into account skewness and kurtosis. When the skewness is positive, Adjusted Sharpe ratio increases, and vice versa. It is calculated as follows:

$$\text{Adjusted Sharpe ratio} = Sharpe\ ratio\left[1 + \left(\frac{S}{6}\right) * Sharpe\ ratio - \left(\frac{E}{24}\right) * Sharpe\ ratio\right]$$

Where,

Sharpe ratio – Sharpe ratio as seen is section 4.1.

S – skewness

E – excess kurtosis

As can be seen from the equation above, Adjusted Sharpe ratio also accounts for the fact that investors prefer positive skewness and negative kurtosis. Another important takeaway from the above mentioned equation is that Adjusted Sharpe ratio will yield the same result as the original Sharpe ratio if the results are normally distributed; reporting skewness and kurtosis are equal to zero.

4.1.2. Modified Sharpe ratio

An important feature of the Sharpe ratio is the fact that it becomes negative in cases of the risk free rate being higher than the return on the portfolio, which might happen during occurrences of large and long downturns in the market. When comparing two funds, Israelsen (2009) elaborates that the fund with higher return and lower standard deviation will have a less negative Sharpe ratio. In order to overcome this difficulty, author corrects for the standard deviation as suggested by Israelsen (2009) as follows:

Where:

$$\text{MSR} = \frac{Rp - Rf}{\sigma^{(\frac{ER}{|ER|})}}$$

- MSR – modified Sharpe ratio
- Rp – return on the portfolio
- Rf – risk free rate
- σ_p – standard deviation of a portfolio
- ER is the excess return on the portfolio, defined as a difference between the return on a portfolio and the risk free rate.

Israelsen proposes this modification as it would allow for a fund with lower return and higher standard deviation to have a more negative return than its counterpart. Therefore, adding an exponent which contains excess return over the absolute value of excess return corrects for this issue, and allows for more appropriate representation.

4.2. Treynor measure

The first widely accepted (1965) and still used measure developed to incorporate both risk and return when assessing one's portfolio performance is Treynor's measure. This measure shows whether an investor has gained proper compensation according to the risk undertaken while making an investment.

It is calculated as follows:

$$\text{Tp} = \frac{Rp - Rm}{\beta p}$$

Where,

T_p – Treynor ratio

R_p – return on a portfolio (return of a mutual fund)

R_m – return on the market (benchmark index)

B_p – beta of the portfolio

As it can be observed, the Treynor measure shows how excess return on the portfolio (Rp – Rm) is related to the measure of systematic risk, i.e. beta (Treynor, 1965). Main difference between the Sharpe ratio and Treynor measure is that Treynor uses beta as a volatility measure, whilst Sharpe uses standard deviation. Beta measures the systematic risk that shows the volatility of one's portfolio when compared to the market. The market is considered to have a beta of 1. Therefore, if a mutual fund reports beta that is higher than 1, it means that the fund is considered to be riskier than the market. On the other side, if a mutual fund reports beta that is smaller than 1, this fund is considered to be less risky when compared to the market. Finally, a beta of 1 indicates that the movement in the mutual fund net asset value should completely reflect the movement in the market, as both the market and the mutual fund are considered to have the same volatility. Beta of the portfolio is calculated as follows:

$$\beta p = \frac{cov\ (R_{p,}R_{m)}}{\sigma^2(R_m)}$$

Where,

B_p – Beta of the portfolio

R_p – return on a portfolio (return of a mutual fund)

R_m – return on the market (benchmark index)

σ^2 – variance of the market (benchmark index)

When stating beta is the systematic risk, it is assumed that it represents the amount of undiversifiable risk, meaning the risk that affects the market as a whole, and not a particular individual asset, portfolio or industry. The only way for one to diversify such risk is to further diversify a portfolio by including assets which are not perfectly correlated with the ones in the existing portfolio. For instance, systematic risk, i.e. beta would be offset only when then the two assets are considered to be a perfect hedge.

One can argue that the Treynor ratio is a suitable measure to evaluate the performance of well-diversified portfolios, as it assumes systematic risk. Since systematic risk captures the portion of risk which has not been eliminated by diversification, it can bring a lot of value for the investor which has diversified his portfolio to the many assets (Le Sourd, 2007).

Hence, it can be clearly seen why investors would seek a higher Treynor's measure, i.e. higher ratio. Mutual funds with a higher Treynor ratio perform better than the ones with a lower ratio, as they receive higher returns over the risk free investment.

4.3. Jensen's alpha

Jensen (1968) argues that besides relative measures of performance, such as the Sharpe ratio and Treynor's ratio, an absolute measure of performance is needed. As absolute measures of performance are focused on ranking portfolios, meaning whether one portfolio is better in comparison to another. He adds to this by saying it would also be valuable to have information on how one portfolio performs relative to an absolute standard, and not only whether one portfolio is better than another.

$$\text{Jensen}'\text{s alpha} = \text{Rp} - (\text{Rf} + \text{Bp} * (\text{Rm} - \text{Rf}))$$

Where,

R_p – return on a portfolio (return of a mutual fund)

R_f – return on the risk free rate

R_m – return on the market (benchmark index)

β – beta of the portfolio

If Jensen's alpha is positive, it means that the mutual fund manager has outperformed the market, while the negative alpha indicates that the mutual fund manager has underperformed the market. Moreover, a mutual fund manager who has a positive alpha and a beta smaller than one indicated that he/she managed to outperform the market taking on less risk.

Bollen (1999) points out the main disadvantages of Jensen's alpha as it neither considers positive skewness nor does it account for the portfolio not being diversified.

4.4. Information ratio

The second absolute measure considered in this thesis is the Information ratio, also known as appraisal ratio. The foundation for the Information ratio is the Markowitz- mean variance framework, basically assuming that mean and variance of returns of observed assets are sufficient to evaluate performance Goodwin (1998).

This measure indicates how well the mutual fund managers are performing compared to the market. It measures excess returns as a difference between the return on the portfolio and return on the market. The only difference between the Information and Sharpe ratio is in the calculation of excess returns, as Sharpe uses the risk free rate, and Information ratio considers market returns.

$$\text{Information ratio} = \frac{Rp - Rm}{\sigma}$$

Where,

R_p – return on a portfolio (return of a mutual fund)

R_f – return on the market, i.e. benchmark index

σ_p – standard deviation of a portfolio

One should be in a favour of a higher Information ratio, as it indicates that the mutual fund manager is more consistent in beating the market. On the other side, the lower the Information ratio, the lower the ability of the mutual fund manager to perform better when compared to

the market. It also shows whether the mutual fund managers have beaten the market returns (return on the relative benchmark index). If the information ratio is less than zero, it means that the mutual fund manager has performed worse than the benchmark. If the mutual fund manager has performed better than the market this will result in an Information ratio above 1.

The main limitation of this measure is s value is highly dependent on the performance of the market. More precisely, in cases of market drawdown, a positive information ratio usually indicates good performance of a mutual fund manager. However, it would not account for the fact that those mutual fund managers might still experience significant losses, and the only reason why their information ratio is higher than zero is because the market has performed worse than the fund they are managing.

Moreover, another limitation of this is that is does not explain the underlying reasons which made the mutual fund manager outperform or underperformed the market, i.e. luck versus skill. Moreover, it is heavily impacted by the choice of an index. Goodwin (2009) pointed out those managers who were using Russell 1000 index as a benchmark experienced higher information ratios than ones who used S&P 500.

5. Data

The data source used to examine, assess and compare performance of Islamic, SRI and Green mutual equity funds was Bloomberg. The rationale behind the use of Bloomberg is that it is the only database, as far as the author is aware, which provides data on all three types of funds. For that reason, the author decided to opt for only one database, to avoid for potential differences in the results by obtaining data from multiple sources. Data was collected using the fund screener, which allows for different filters when obtaining the sample for the analysis. Thus, for each type of fund, specific filters were used. For Islamic mutual equity funds, the general attribute "Islamic" has been used. For SRI mutual equity funds, general attribute "Socially Responsible" was included in the screening universe. For Green mutual equity funds, "Environmental" was the general attribute used to narrow the amount of funds considered.

Apart from using specific screens to differentiate each fund type, several common screens were applied. First and foremost, only mutual funds with open-end equity orientation were included in the analysis, and commodity, fixed income, mixed allocation, money market, speciality and real estate funds were excluded from the analysis. Moreover, only those funds with the primary share class labelled as "yes" were considered. Finally, funds which have less than 24 months of data were also excluded from the analysis.

Data consists of monthly Net Asset Values, and is adjusted for any abnormal or normal cash adjustments and for capital changes, such as dividends. When working with the data which includes Islamic assets, it is preferred to choose data with monthly frequency since the stocks which are part of any Islamic index were reviewed for compliance on a monthly or quarterly basis to account for the impact of Shariah screening (Ashraf, 2016).

The time period considered was from 1 January 2001 to 31 December 2015. The launch date is chosen to capture the potential impact of the two financial crisis, and to see whether one, or all funds, were prone to achieving less downfall in time of the crisis, when compared to each other using the traditional performance measures.

For the calculation of Information ratio, Treynor measure and Jensen's alpha, benchmarks for each type of fund are required. Data for benchmarks was obtained from Bloomberg. Moreover, for the calculation of Sharpe ratio, Adjusted Sharpe ratio, Modified Sharpe ratio, Treynor measure and Jensen's alpha, risk free rate is needed. Data for risk free rate was obtained from US Department of Treasury, which provides data on the US risk free rates.

Exhibit 7: Fund types and their relative benchmarks and risk-free interest rate points to the different indices and risk-free interest rate used to assess and compare performance of funds considered in the sample.

Fund type	Benchmark index	Risk-free interest rate
Islamic	Dow Jones Islamic World	1 month Treasury bill
SRI	Dow Jones SRI World	1 month Treasury bill
Green	Nasdaq Green Economy Global Benchmark Index	1 month Treasury bill

Exhibit 7: Fund types and their relative benchmarks and risk-free interest rate
Source: Author's illustration

As the sample of funds observed consists of funds present in different geographic areas, to avoid focusing solely on one geographic area, indices that capture the state of the market worldwide were used as a proxy rather than one which focus solely on the US, Europe or other specific regions. Ideally, one would use indices from the same family for all three types of funds to ensure consistency, such as Dow Jones or Nasdaq. However, due to lack of data, for both Islamic and SRI mutual equity funds, Dow Jones index was used, while for Green mutual equity funds, Nasdaq Green Economy Global Benchmark Index was used. While data for the Dow Jones Islamic World and Dow Jones SRI World exists for the whole observed period, the first data point for Nasdaq Green Economy Global Benchmark Index is November 2010, and thus Green mutual equity fund were compared with their Islamic and SRI counterparts only for the last 5 years of the observed period. If one would choose other indices as benchmarks for Green mutual equity funds, they would most certainly be ones which do not capture the global effect, but are rather focused solely on one geographic area. Moreover, another reason in favour of choosing Nasdaq Green Economy Global Benchmark Index was to use a well-established, known and recognized index, which is credible and accepted by scholars worldwide.

As a proxy for the risk free interest rate, US 1 month Treasury bill was used for several reasons. First, due to the non-existence of a proxy for the global risk free rate, one has to choose which country risk free rate will serves as a proxy. The most common proxy used by other authors for the risk free rate when analysing same performance measures is the US Treasury bill. Additionally, the reason why the 1 month risk free rate is considered is to obtain the same frequency of data as for Islamic, SRI and Green mutual equity funds and their benchmarks. Moreover, it is important to mention that the author is aware of Riba, which forbids Muslim investors from allocating their assets in any type of assets which pays back

interest, and thus, cannot earn the risk free rate. However, as the use of the risk free rate is necessary to calculate several performance measures in this thesis, it will still be used. (Ashraf, 2016)

The total number of funds at the end of the sample period was 611, as seen in Exhibit 8: Total number of observed Islamic, SRI and Green mutual equity funds (2001 - 2015). More precisely, Exhibit 7 shows the cumulative number of funds that the author has included in the performance analysis during each year of the observed period. The reason why 2013 is equal to 2015 is because the author included only those funds which have at least 24 months of observable outputs, thus excluding all funds which were incepted later than 31 December 2013.

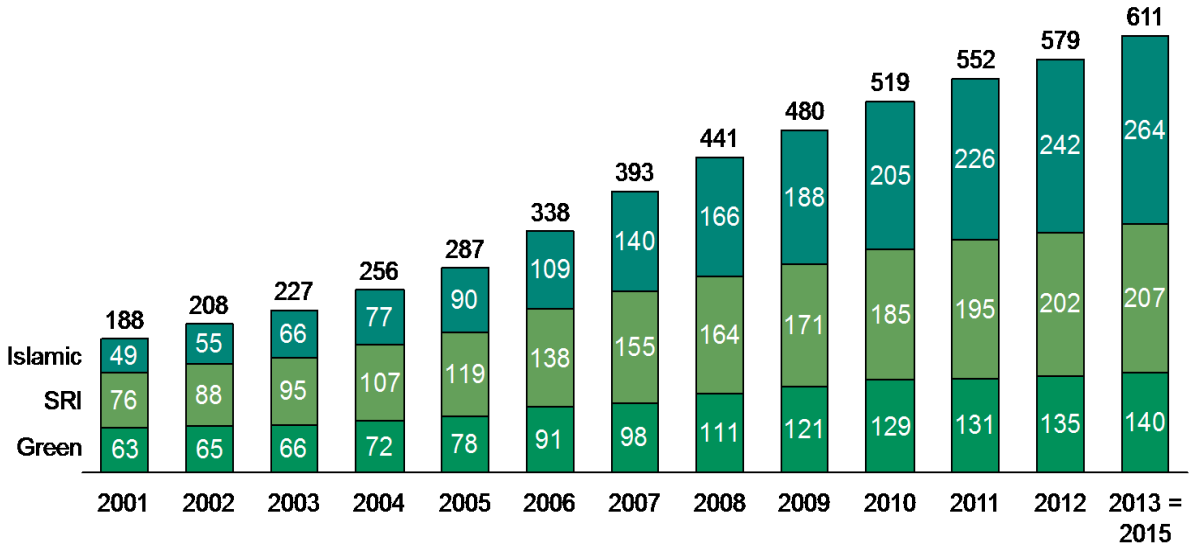

Exhibit 8: Total number of observed Islamic, SRI and Green mutual equity funds (2001 - 2015)
Source: Author's illustration

The overall increase of the total number of observed funds is astonishing, as the first data point consists of 188 funds in 2001, and the last data point in 2013 consists of 611 funds, representing an increase of 225% from the first to the last data point. If one would not exclude those funds which report less than 24 months of data, the total amount of funds at the end of 2015 would be even higher. The biggest growth is seen when observing specifically Islamic funds, which have reported growth of 439% throughout the observed period, followed by SRI mutual equity funds, which have increased in number by 172% over the period. Finally, the smallest, but still remarkable growth was reported by Green mutual equity funds with an increase of 122%.

At the end of the observed period, Islamic mutual equity funds accounted for 43.21% of the whole sample, making them the largest group of funds considered. SRI mutual equity funds account for 33.89% of the total funds considered, being the second largest group, while Green funds made up the remaining 22.9% of the sample, representing the smallest number of observed funds. It is not surprising that Green funds represent the smallest category, as author has argued in the preceding sections that Green mutual equity funds are considered to be a subgroup of the SRI mutual equity funds category.

However, it is intriguing to observe how many new funds were included each year in the sample, rather than just observing the starting point and the end cumulative number of observations. Exhibit 9: Number of new Islamic, SRI and Green mutual equity funds per year (2001 – 2015) shows is how many new funds were incepted each year.

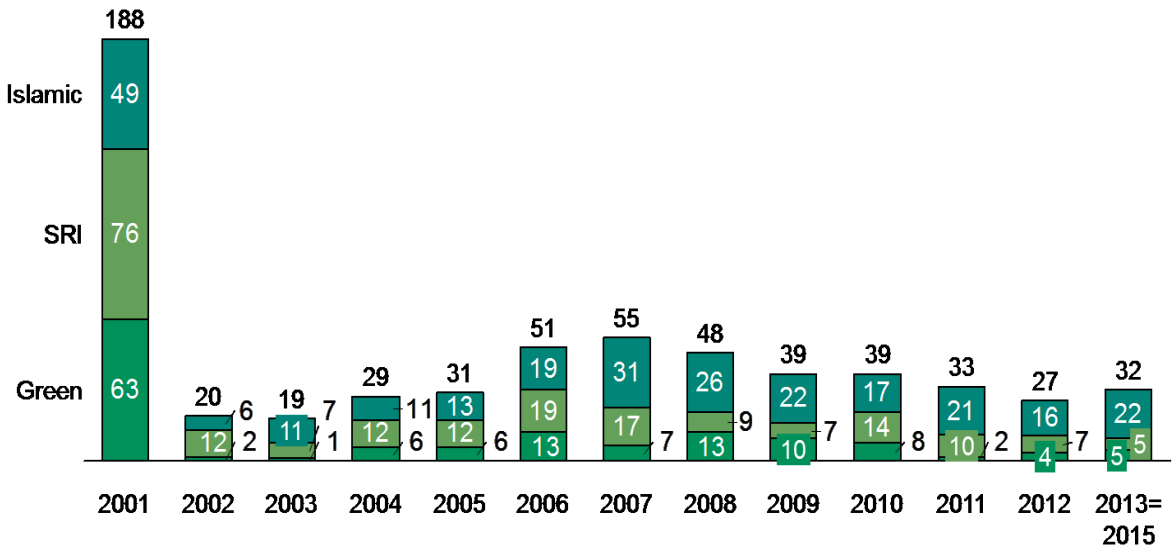

Exhibit 9: Number of new Islamic, SRI and Green mutual equity funds per year (2001 – 2015) Source: Author's illustration

From 2001 onwards, there were periods of highs and lows in the number of new funds incepted each year. For instance, 2002 and 2003 account for the smallest increase in the number of fund inceptions during the sample period, while the period from 2006 to 2008, reported the largest increase in the number of funds incepted each year. This sudden increase in the number of funds is highly correlated with the time of the financial crisis, which might point to the fact that investors are prone to take on less excessive risk during periods of high volatility, and are thus, turning to investments that they see as safer or less risky, such as funds observed in this thesis. Nevertheless, excluding the period from 2006 to 2008, the

number of newly incepted funds each year is relatively consistent, with Islamic mutual equity funds accounting for the highest number of new funds incepted each year.

Geographical origination of the funds in the sample is another important aspect to consider. If allocation of funds would be approximately the same, one could compare their performance in specific regions and countries. However, countries of domicile, and consequently regions, in our sample differ a lot from one type of fund to another. For that reason, the global comparison has been adopted. In case one would compare the Islamic, SRI and Green equity funds in countries where the most of the Islamic mutual funds originate from, the amount of SRI and Green equity funds present in that areas would be too small and consequently lead to the statistically insignificant results.

So far, the author has presented only qualitative characteristics of the data. Quantitative characteristics of the data will be presented hereunder.

First calculated metrics are the arithmetic mean returns of the observed funds and their respective benchmarks along with betas of the funds in the sample, presented in the Exhibit 10: Average annual returns and beta of Islamic, SRI and Green mutual funds and their respective benchmarks (2001 – 2015).

Return on a portfolio at time t is calculated as follows:

$$\text{Rp} = \frac{NAVt - NAVt}{NAVt - 1}$$

Where,

R_p – return on a portfolio at time t

NAV_t – Net Asset Value of the portfolio at time t

NAV_{t-1}– Net Asset Value of the portfolio at time t-1

Return on a market (benchmark) at time t is calculated as follows:

$$\text{Rm} = \frac{Pt - Pt}{P_{t-1}}$$

Where,

R_m – return on a market at time t

P_t – Closing price of an index at time t

P_{t-1}– Closing price of an index at time t

	Average annual returns						Beta		
	Islamic	SRI	Green	Dow Jones Islamic World	Dow Jones SRI World	Nasdaq Green Economy Global	Islamic	SRI	Green
2001	-1.2%	-10.7%	-10.7%	-19.6%	-16.5%	N/A	0.32	0.87	N/A
2002	0.3%	-28.4%	-32.4%	-23.6%	-23.4%	N/A	0.13	0.23	N/A
2003	18.3%	23.8%	26.9%	25.5%	29.9%	N/A	0.06	0.37	N/A
2004	10.6%	12.4%	14.7%	8.9%	10.2%	N/A	0.02	0.01	N/A
2005	6.9%	21.9%	26.6%	8.7%	6.6%	N/A	-0.08	-0.14	N/A
2006	3.3%	14.3%	16.3%	14.1%	19.6%	N/A	0.04	0.00	N/A
2007	23.9%	1.9%	4.2%	15.7%	9.2%	N/A	0.04	0.01	N/A
2008	-39.8%	-42.4%	-41.1%	-45.2%	-54.7%	N/A	-0.01	0.04	N/A
2009	39.4%	29.6%	30.7%	31.3%	31.1%	N/A	0.24	0.30	N/A
2010	17.9%	12.4%	11.8%	13.9%	6.2%	N/A	-0.15	-0.06	N/A
2011	-1.8%	-10.2%	-13.6%	-5.8%	-9.0%	-12.6%	0.14	0.25	0.53
2012	11.2%	12.8%	12.3%	11.4%	12.8%	14.0%	-0.12	-0.10	0.55
2013	14.5%	24.2%	24.9%	18.1%	18.4%	22.8%	0.04	0.06	0.58
2014	6.2%	9.0%	11.8%	4.8%	-0.6%	4.4%	-0.15	-0.04	0.41
2015	-2.6%	5.6%	9.4%	-1.4%	-5.9%	-7.3%	0.17	0.11	0.84
Average	**7.1%**	**5.1%**	**6.1%**	**3.8%**	**2.3%**	**4.2%**	**0.02**	**0.06**	**0.58**

Exhibit 10: Average annual returns and beta of Islamic, SRI and Green mutual funds and their respective benchmarks (2001 – 2015)

Source: Author's illustration

Out of three types of mutual equity funds considered, Islamic ones report the highest average returns (7.1%) throughout the whole sample period. Green mutual equity funds report somewhat lower returns (6.1%) than Islamic mutual equity funds, while the SRI mutual equity funds are the worst performers if one looks solely at the returns, with the average return of 5.1%) Moreover, looking at the average yearly returns, Islamic mutual equity funds report the highest return (39.4%) in the observation period, followed by Green mutual equity funds (30.7%) and SRI mutual equity funds (29.6%), Captivatingly, the 2009 was the year when all three types of funds report the highest returns, the year in which the market started slowly recover after the global financial crisis. This might indicate that investors perceived these types of funds less volatile than the conventional ones, potentially allocating more assets in the period of high uncertainty. Further, the year preceding the year with the highest average returns, was the year in which all three types of funds reported their highest drawdown. Out of all, SRI mutual equity funds had the maximum drawdown (-42.1%), followed by the Green mutual equity funds (-41.1%), and Islamic mutual equity funds (-39.8%). All in all, one might conclude, looking solely at returns that Islamic mutual equity funds perform best. They report overall the highest average returns, the maximum returns and minimum drawdown looking at the results year by year. SRI mutual equity funds perform the worst, reporting lowest average returns, minimum returns and maximum drawdown when looking at the results year by year.

In order to evaluate the performance of funds regarding their respective benchmarks, the annual average returns of the benchmarks were calculated. When comparing each type of fund with their respective benchmarks, one can say that, on average, each type of fund reports highest returns than its respective benchmark. However, in the case of Islamic and SRI mutual funds, their benchmark has higher maximum drawdown, while for the Green mutual equity funds the benchmark performs better than the fund, reporting lower maximum drawdown and higher maximum return.

To measure the systematic risk, beta was calculated to observe whether the average of the sample funds is less or more volatile than the market. Calculated betas show that all three types of funds are less volatile than the market, as their betas are lower than one. Out of three types of funds, the one which has the highest beta is the SRI, closely followed by the Green one. Islamic mutual equity funds report the lowest beta by far, which makes them the least volatile when compared to the market.

Finally, data was compared using the basic descriptive statistics, such as Standard deviation, Skewness and Kurtosis, displayed in the Exhibit 11: Descriptive statistics of Islamic, SRI and Green mutual funds (2001 – 2015).

	Average standard deviation			Skewness of monthly returns			Kurtosis of monthly returns		
	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green
2001	17.3%	20.7%	20.4%	-0.2138	-0.1437	-0.1310	0.3237	-0.4085	-0.4482
2002	13.6%	21.1%	23.5%	0.0895	0.1544	0.1804	0.3722	-0.1945	-0.2962
2003	10.8%	15.4%	17.4%	0.1907	-0.0007	-0.0217	0.4838	-0.3955	-0.3316
2004	10.8%	10.6%	12.3%	-0.1309	0.0756	0.2334	0.6329	-0.5261	-0.7154
2005	10.2%	12.0%	12.1%	0.3115	-0.3016	-0.4446	0.1124	-0.1504	-0.1464
2006	14.0%	10.1%	11.4%	0.4330	-0.6769	-0.6479	1.5892	1.0463	0.8242
2007	13.6%	9.8%	11.0%	-0.2531	-0.1601	0.0000	0.7418	-0.3130	-0.4700
2008	21.3%	24.2%	25.9%	-0.5467	-0.3087	-0.2180	0.5500	-0.3854	-0.4983
2009	27.3%	19.7%	18.7%	0.7474	0.1344	0.2980	1.1450	0.9949	1.3238
2010	16.9%	15.0%	15.7%	-0.6908	-0.0885	-0.0420	1.3902	-0.4858	-0.4947
2011	13.7%	14.7%	15.5%	-0.0841	-0.0610	-0.0254	0.3619	1.1884	1.1650
2012	10.9%	11.8%	12.5%	-0.2534	-0.5686	-0.4455	0.4467	1.2796	1.0956
2013	10.9%	9.7%	9.8%	0.1743	-0.3681	-0.4147	0.6466	0.3882	0.3527
2014	11.6%	7.0%	9.2%	-0.3401	0.0267	0.0975	-0.1657	0.0638	0.1579
2015	14.9%	12.2%	16.3%	-0.4365	-0.0083	-0.0378	1.0413	-0.3000	-0.5702
Average	**14.5%**	**14.3%**	**15.4%**	**-0.07**	**-0.15**	**-0.17**	**0.47**	**0.52**	**0.06**

Exhibit 11: Descriptive statistics of Islamic, SRI and Green mutual funds (2001 – 2015)
Source: Author's illustration

Standard deviation measures to which extent is the data in the sample spread around the mean. Thus, high standard deviation indicates that data deviates a lot from the mean, while small standard deviation means that data does not significantly deviates around the mean. All three type of funds report small standard deviation, ranging from the lowest (14.3%) for SRI mutual equity funds to the highest (15.4%) for the Green mutual equity funds, meaning that

our data is closely spread around the mean. Moreover, those funds which experience higher standard deviation are considered to be riskier, as their data points deviate more around the mean than the one of those which has more uniformly distributed results around the mean. Based on this, Green mutual equity funds would be considered as the riskiest, while the SRI mutual funds would be considered the least risky.

While standard deviation measures the first moment of observations around the mean, skewness and kurtosis measure the third and the forth moment, respectively.

Skewness measures the symmetry of the observed data. The skewness of zero would indicate that the data follows the normal distribution, thus any result which reports skewness near zero indicates that the data is almost perfectly symmetric to left and right and thus, allows saying that the data is normally distributed. In our sample, all three types of funds report skewness of monthly returns relatively close to zero, meaning that they are following normal distribution. Moreover, all three types of fund report negative skewness, indicating that the observations are skewed to left.

Kurtosis measures whether the data experiences heavy or light tails with respect to the normal distribution. Accordingly, the higher the kurtosis, the heavier the tails, meaning that the data has a lot of outliers. On the contrary, the lower the kurtosis, the flatter and lighter are tails, which means that the data has relatively small amount of outliers. In our sample, all three types of funds report low kurtosis, thus indicating relatively flat distribution. Green mutual equity funds report the lowest kurtosis of nearly zero, and Islamic and SRI mutual equity funds report the skewness of 0.47, and 0.52, respectively.

6. Results

Exhibit 12: Relative Performance Measure Results for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) presents the results for relative performance measures, namely Sharpe ratio, Adjusted Sharpe ratio, Modified Sharpe ratio and Treynor measure for the whole sample period.

	Sharpe ratio			Modified Sharpe ratio			Adjusted Sharpe ratio			Treynor measure		
	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green
2001	-0.0964	-0.6645	-0.6116	0.1449	-0.0127	0.0026	0.1734	0.2068	0.2040	0.0720	-0.0891	N/A
2002	-0.1818	-1.2553	-1.4471	0.1606	-0.0642	-0.0723	0.1364	0.2110	0.2350	0.7775	5.2087	N/A
2003	1.1255	1.2028	1.2472	1.1786	1.2040	1.2592	0.1084	0.1538	0.1743	3.0831	0.5272	N/A
2004	0.5070	0.6733	0.7636	0.5869	0.7065	0.8033	0.1083	0.1062	0.1231	-0.0430	-0.4126	N/A
2005	-0.3649	1.3846	1.7451	0.4754	1.4316	1.7451	0.1015	0.1197	0.1207	0.3722	-1.4530	N/A
2006	0.7972	0.9460	0.9559	0.9739	0.9653	0.9947	0.1401	0.1008	0.1145	0.9572	0.5143	N/A
2007	1.2633	-0.1625	0.0428	1.2802	0.2332	0.3630	0.1365	0.0982	0.1107	-31.9343	-3.7277	N/A
2008	-1.8533	-1.7552	-1.5888	-0.1199	-0.1260	-0.1315	0.2133	0.2425	0.2593	-4.1266	-3.5462	N/A
2009	1.4455	1.2592	1.3094	1.4912	1.2620	1.3134	0.2732	0.1966	0.1873	1.6307	0.7418	N/A
2010	0.8632	0.5869	0.5544	0.8832	0.6230	0.6138	0.1693	0.1502	0.1574	-1.2145	0.3566	0.2284
2011	-0.3335	-0.8428	-1.0541	0.0845	-0.0129	-0.0225	0.1374	0.1473	0.1551	1.7956	-0.3558	-0.3482
2012	0.7638	0.7938	0.7242	0.7828	0.8164	0.7386	0.1086	0.1182	0.1251	-0.2643	-0.7644	0.1267
2013	1.1439	2.2632	2.3347	1.2178	2.2751	2.3602	0.1088	0.0971	0.0985	1.5095	16.1160	0.3306
2014	0.1748	0.8388	1.0750	0.4836	0.8913	1.1447	0.1158	0.0699	0.0924	-0.6500	-2.0404	0.0742
2015	-0.2695	0.1707	0.3693	0.2123	0.2900	0.4446	0.1486	0.1218	0.1623	-0.3706	0.0762	0.0851
Average	**0.3323**	**0.3626**	**0.4280**	**0.6557**	**0.6988**	**0.7705**	**0.1453**	**0.1427**	**0.1547**	**-1.8937**	**0.7434**	**0.0828**

Exhibit 12: Relative Performance Measure Results for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015)

Source: Author's calculations

Several conclusions can be drawn from this Exhibit regarding the comparative performance of each type of fund. Considering only Sharpe ratio, Green mutual equity funds are, on average, the best performers, as they report the highest Sharpe ratio out of all three mutual equity funds. Nonetheless, all three types of mutual equity funds report a relatively similar Sharpe ratio, which means their performance does not significantly differ. Modified Sharpe ratio shows similar results, which is in line with the expectations as both performance measures use the same data (as the Modified Sharpe ratio is only calculated to offset for the negative returns which might impact the results). The Adjusted Sharpe ratio is calculated to account for the skewness and kurtosis, as the original Sharpe ratio disregards the fact that investors prefer positive skewness and negative kurtosis. Adjusted Sharpe ratio figures show that the best performing type of fund is the Green mutual equity fund, while both SRI and Islamic mutual equity funds exhibit similar results. Therefore, looking only at the Sharpe ratio as a measure

of performance would lead to the conclusion that the Green mutual equity funds are the most desirable to invest in, as they allow investor to gain more return for the same amount of risk taken.

Second major performance indicator considered in this thesis is the Treynor measure. As previously stated, the main difference between Treynor and Sharpe ratio is how the risk premium is calculated. More specific, Treynor uses return on the market for the calculation of the risk premium, while Sharpe uses the risk free rate instead of return on the market. In principal, one favours the higher Treynor ratio values, as that means that fund is less risky, i.e. their managers earn higher having the same amount, therefore showing potentially better skills. In the observed sample, SRI mutual equity funds report the highest Treynor ratio, meaning that they are considered, on average, to be the best performers, as return on them is the highest compared relatively to the risk of the market. Green mutual funds report Treynor ratio which is close to zero, however, still positive. The Islamic mutual funds are considered, by far the worst performers and exhibit significantly negative Treynor ratio, meaning that their they have, on average, earned lower returns than the risk free assets.

Exhibit 13: Absolute performance measures results for Islamic, SRI and Green mutual equity funds (2001 – 2015) presents the results for absolute performance measures, namely Information ratio and Jensen's alpha.

	Information ratio			Jensen's alpha		
	Islamic	SRI	Green	Islamic	SRI	Green
2001	0.7962	0.0732	N/A	0.0355	-0.7187	N/A
2002	1.0459	0.0292	N/A	0.0044	-0.8448	N/A
2003	-0.1692	-0.3192	N/A	0.1702	1.5088	N/A
2004	0.2940	0.2336	N/A	0.0831	0.8418	N/A
2005	0.3348	1.2037	N/A	0.0238	1.5819	N/A
2006	0.2395	-0.1732	N/A	0.0165	0.8659	N/A
2007	0.6661	0.0588	N/A	0.2228	-0.0715	N/A
2008	-0.0166	0.0145	N/A	-0.4274	-1.4368	N/A
2009	-0.0243	-0.0674	N/A	0.4204	1.5835	N/A
2010	0.1061	0.4663	N/A	0.1138	0.6827	N/A
2011	0.2780	0.0379	0.0353	-0.0155	-0.7858	-0.1536
2012	0.0764	0.0007	-0.1129	0.0542	0.7713	0.1073
2013	0.1051	0.6928	0.4132	0.1255	2.8685	0.2357
2014	0.4020	1.2767	1.0253	-0.0038	1.0024	0.0986
2015	0.3876	0.6075	0.9543	-0.0210	0.2259	0.0886
Average	**0.2826**	**0.2584**	**0.4630**	**0.0501**	**0.5047**	**0.0753**

Exhibit 13: Absolute performance measures results for Islamic, SRI and Green mutual equity funds (2001 – 2015)

Source: Author's calculations

Information ratio presents the first absolute performance measure used to assess and compare performance of the funds in the sample. Similarly to the Sharpe ratio, one prefers higher Information ratio, as it indicates that the investor would earn more return while experiencing the same level of risk. Furthermore, positive Information ratio points that a mutual fund manager has outperformed the market, while the negative Information ratio points that a mutual fund manager has underperformed the market. Additionally, the higher the Information ratio, the more consistent a manager is in beating the market. According to the obtained results, all three types of funds exhibit positive Information ratios, meaning that their managers have, on average, outperformed the market. However, the best performing managers were the ones managing the Green mutual equity funds, as they report the highest Information ratio amongst competitors. Contrary to the results obtained for the Sharpe ratio, the worst performing funds were not Islamic, but rather SRI mutual equity funds, as they exhibit the lowest Information ratio. This difference is due to calculation of the risk premium, where the Sharpe ratio uses risk free rate to calculate the risk premium, and the Information ratio assumes market return as a relevant metric to calculate the risk premium.

Second absolute performance measure considered is the Jensen's alpha. Results report positive alpha for all three types of fund, which indicates that they all have, on average, performed better when compared to the market. Surprisingly, SRI mutual equity funds report the highest alpha (0.51), well above the alphas reported by the Green mutual equity fund (0.08) and Islamic mutual equity funds (0.05), indicating that according to Jensen's alpha, they are the considered to be best performers. The Islamic mutual equity funds are the one considered as the worst performers, as their mutual equity fund managers' report, on average, the lowest abnormal rate of return.

After confirming that economic differences in the performance of each three types of fund exist, t-test was computed in order to examine whether those differences are statistically significant. T-test was computed separately for each performance measure (on a 95% confidence interval), comparing two pairs of funds at the time (pairs: Islamic mutual equity funds and SRI mutual equity funds, Islamic mutual equity funds and Green mutual equity funds, SRI mutual equity funds and Green mutual equity funds). Results of the t-test for the relative performance measures are presented in Exhibit 18: T-test for relative performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015) in Appendix. Results show that differences in the performance are not statistically significant. Moreover, same results apply to the absolute performance measure, as presented in Exhibit 19: T-test for

absolute performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015) in Appendix. All of the reported p-values are above 0.05, which indicate that we cannot confirm the "real difference" between the funds in our sample.

It has already been argued that reporting negative Sharpe ratios might lead to misleading results. Although the author attempted to correct the negative Sharpe ratio, the results still show several observations which exhibit negative results. Therefore, in the Exhibit 14: Sharpe ratio, Adjusted Sharpe ratio, Modified Sharpe ratio excluding negative values (2001 -2015), only those values which report positive results will be considered.

	Sharpe ratio			Modified Sharpe ratio			Adjusted Sharpe ratio		
	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green
2001	N/A	N/A	N/A	0.1449	N/A	0.0026	0.1734	0.2068	0.2040
2002	N/A	N/A	N/A	0.1606	N/A	N/A	0.1364	0.2110	0.2350
2003	1.1255	1.2028	1.2472	1.1786	1.2040	1.2592	0.1084	0.1538	0.1743
2004	0.5070	0.6733	0.7636	0.5869	0.7065	0.8033	0.1083	0.1062	0.1231
2005	N/A	1.3846	1.7451	0.4754	1.4316	1.7451	0.1015	0.1197	0.1207
2006	0.7972	0.9460	0.9559	0.9739	0.9653	0.9947	0.1401	0.1008	0.1145
2007	1.2633	N/A	0.0428	1.2802	0.2332	0.3630	0.1365	0.0982	0.1107
2008	N/A	N/A	N/A	N/A	N/A	N/A	0.2133	0.2425	0.2593
2009	1.4455	1.2592	1.3094	1.4912	1.2620	1.3134	0.2732	0.1966	0.1873
2010	0.8632	0.5869	0.5544	0.8832	0.6230	0.6138	0.1693	0.1502	0.1574
2011	N/A	N/A	N/A	0.0845	N/A	N/A	0.1374	0.1473	0.1551
2012	0.7638	0.7938	0.7242	0.7828	0.8164	0.7386	0.1086	0.1182	0.1251
2013	1.1439	2.2632	2.3347	1.2178	2.2751	2.3602	0.1088	0.0971	0.0985
2014	0.1748	0.8388	1.0750	0.4836	0.8913	1.1447	0.1158	0.0699	0.0924
2015	N/A	0.1707	0.3693	0.2123	0.2900	0.4446	0.1486	0.1218	0.1623
Average	**0.8983**	**1.0119**	**0.9607**	**0.7111**	**0.9726**	**0.9819**	**0.1453**	**0.1427**	**0.1547**

Exhibit 14: Sharpe ratio, Adjusted Sharpe ratio, Modified Sharpe ratio excluding negative values (2001 -2015)

Source: Author's illustration

The biggest difference when comparing Exhibit 12 and Exhibit 14 is observable for Green and SRI mutual equity funds, as the Sharpe ratio for SRI mutual equity funds is higher when negative results were excluded than the one of the Green mutual equity fund. The opposing result was presented in the Exhibit 12. Islamic mutual equity funds still report lowest Sharpe ratio, and therefore, represents the least desirable investment if one solely looks at the Sharpe ratio as a metric of performance. In the case of Adjusted Sharpe ratio, results did not change as all three types of funds did not report any negative values after adjusting for skewness and kurtosis.

Moreover, t-test has been done in order to assess whether these differences are statistically significant. Results of the t-test are presented in Exhibit 20: T-test for relative performance

measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), excluding the negative periods in Appendix and show that only economic differences can be confirmed, as there are no statistically significant results for either measure. T-test has been done only for first two measures, as third one does not exhibit any negative values and thus, is the same as in Exhibit 18.

One of the sub questions in this thesis was to examine the performance of Islamic, SRI and Green mutual equity funds excluding the recent financial crisis which has lasted from 2006 – 2008 and the dot.com bubble, which lasted from 1995 – 2011 in order to assess whether there are any differences with the complete sample period results. Exhibit 15: Relative performance measures results for Islamic, SRI and Green mutual equity (2001 – 2015) funds excluding 2001, 2007 and 2008 from the observation period.

	Sharpe ratio			Modified Sharpe ratio			Adjusted Sharpe ratio			Treynor measure		
	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green
2001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2002	-0.1818	-1.2553	-1.4471	0.1606	-0.0642	-0.0723	0.1364	0.2110	0.2350	0.7775	5.2087	N/A
2003	1.1255	1.2028	1.2472	1.1786	1.2040	1.2592	0.1084	0.1538	0.1743	3.0831	0.5272	N/A
2004	0.5070	0.6733	0.7636	0.5869	0.7065	0.8033	0.1083	0.1062	0.1231	-0.0430	-0.4126	N/A
2005	-0.3649	1.3846	1.7451	0.4754	1.4316	1.7451	0.1015	0.1197	0.1207	0.3722	-1.4530	N/A
2006	0.7972	0.9460	0.9559	0.9739	0.9653	0.9947	0.1401	0.1008	0.1145	0.9572	0.5143	N/A
2007	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2008	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2009	1.4455	1.2592	1.3094	1.4912	1.2620	1.3134	0.2732	0.1966	0.1873	1.6307	0.7418	N/A
2010	0.8632	0.5869	0.5544	0.8832	0.6230	0.6138	0.1693	0.1502	0.1574	-1.2145	0.3566	N/A
2011	-0.3335	-0.8428	-1.0541	0.0845	-0.0129	-0.0225	0.1374	0.1473	0.1551	1.7956	-0.3558	-0.3482
2012	0.7638	0.7938	0.7242	0.7828	0.8164	0.7386	0.1086	0.1182	0.1251	-0.2643	-0.7644	0.1267
2013	1.1439	2.2632	2.3347	1.2178	2.2751	2.3602	0.1088	0.0971	0.0985	1.5095	16.1160	0.3306
2014	0.1748	0.8388	1.0750	0.4836	0.8913	1.1447	0.1158	0.0699	0.0924	-0.6500	-2.0404	0.0742
2015	-0.2695	0.1707	0.3693	0.2123	0.2900	0.4446	0.1486	0.1218	0.1623	-0.3706	0.0762	0.0851
Average	**0.4726**	**0.6684**	**0.7148**	**0.7109**	**0.8657**	**0.9436**	**0.1380**	**0.1327**	**0.1455**	**0.6319**	**1.5429**	**0.0537**

Exhibit 15: Relative performance measures results for Islamic, SRI and Green mutual equity (2001 – 2015) funds excluding the effects of financial crises

Source: Author's calculations

The most noticeable change is that none of the performance measures exhibit negative average results, which makes their comparison easier and contributes to the overall accuracy. As expected, exclusion of the crises periods, i.e. periods of the significant negative drawdowns, led to the increase in the reported values for all performance measures. For instance, one can note a significant increase in the Sharpe ratios for each type of fund, with the most notable increase for the Green mutual equity funds. The same results apply for the Modified Sharpe ratio. The adjustment for crisis period also confirms the results for Adjusted Sharpe ratio for all three types of fund. Here, the Adjusted Sharpe ratios are somewhat lower

than those reported in the whole same period, which comes from fact that the original Sharpe ratio was originally adjusted to account for the negative results, such as financial crises. Nevertheless, the rank of the performance remains the same, with Green mutual equity funds being, on average, the highest performing ones, and with SRI and Islamic mutual equity funds experiencing the similar results.

Differences in the Treynor ratios prior to the exclusion of the effects of financial crises to the one post the exclusion of financial crises were remarkable for all three types of fund. The most noteworthy difference is one connected to Islamic mutual equity funds. When considering the whole sample period, Islamic funds reported significantly negative Treynor measure, and in the sample period excluding the financial crisis they report positive solid results. Another notable increase was in the result for SRI mutual equity fund, which has more than doubled when compared to the whole sample period and solidified its position as the best performer according to the Treynor measure. Therefore, one can conclude that all three mutual equity fund managers earned the returns on the undertaken market risks.

Same as with the whole sample period, second group of performance measures was the absolute performance measures. Exhibit 16: Absolute performance measures results for Islamic, SRI and Green mutual equity (2001 – 2015), excluding the effects of financial crisis shows the results accounted for the effect of the financial crises.

	Information ratio			Jensen's alpha		
	Islamic	SRI	Green	Islamic	SRI	Green
2001	N/A	N/A	N/A	N/A	N/A	N/A
2002	1.0459	0.0292	N/A	0.0044	-0.2658	N/A
2003	-0.1692	-0.3192	N/A	0.1702	0.2821	N/A
2004	0.2940	0.2336	N/A	0.0831	0.0968	N/A
2005	0.3348	1.2037	N/A	0.0238	0.1637	N/A
2006	0.2395	-0.1732	N/A	0.0165	0.1150	N/A
2007	N/A	N/A	N/A	N/A	N/A	N/A
2008	N/A	N/A	N/A	N/A	N/A	N/A
2009	-0.0243	-0.0674	N/A	0.4204	0.3234	N/A
2010	0.1061	0.4663	N/A	0.1138	0.0836	N/A
2011	0.2780	0.0379	0.0353	-0.0155	-0.0838	-0.1536
2012	0.0764	0.0007	-0.1129	0.0542	0.0776	0.1073
2013	0.1051	0.6928	0.4132	0.1255	0.2228	0.2357
2014	0.4020	1.2767	1.0253	-0.0038	0.0572	0.0986
2015	0.3876	0.6075	0.9543	-0.0210	0.0532	0.0886
Average	**0.2563**	**0.3324**	**0.4630**	**0.0810**	**0.0938**	**0.0753**

Exhibit 16: Absolute performance measures results for Islamic, SRI and Green mutual equity (2001 – 2015), excluding the effects of financial crises

Source: Author's calculations

An intriguing observation regarding the Information ratio is that the exclusion of the crises has benefited SRI mutual equity funds, which are reporting now, on average, higher Information ratio compared to the one of Islamic mutual equity funds, which has reported, on average, higher Information ratio in the whole sample period. This might indicate that during the financial crisis, Islamic mutual fund managers have more skills (or luck) in beating the market, as the reported results for the Islamic mutual equity funds are higher if one includes the observation period. On the contrary, the opposite applies for the SRI mutual equity funds. The fact that SRI outperformed the Islamic mutual equity funds in the period which excludes financial crisis might indicate that SRI mutual equity funds managers are, on average, more consistent in beating the market than the Islamic mutual equity funds. The Green mutual equity funds show the same results prior and post crisis, as the relative benchmark considered as a proxy for their market has inception date after both crises occurred.

Following the same rationale as for the Information ratio, the Jensen's alpha results remain the same prior and post the exclusion of the crises period for the Green mutual equity funds. In the line with the expectations, Jensen's alpha for both Islamic and SRI mutual funds is higher in the observation period which excludes financial crisis, with more noteworthy increase in the SRI mutual funds, which are the best performing funds according to this criteria.

Again, there is an economical difference in the performance measure results for all three types of funds. Same as before, the t-test has been used to assess whether the economic difference is statistically significant or not. It has been confirmed that the results are not statistically significant and that it is not certain that the "real" difference in the performance exists, as all of the reported p-values are above the 5%. Results of the t-test for are presented in Exhibit 21: T-test for relative performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), excluding the effects of financial crises and in Exhibit 22: T-test for absolute performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), in Appendix.

Lastly, all three types of funds were double-sorted and their performance measures were calculated according to the double-sort results for bottom and top decile. First criteria to double-sort funds was their age, top decile being the most mature funds, an bottom decile being the newest funds in our sample. Secondly, funds were sorted according to their betas, from smallest to largest. Exhibit 16: Absolute and relative performance measures after

double-sorting on fund characteristics (age, beta) for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) presents the results of this analysis.

	Top 10th Percentile			Bottom 10 Percentile			High - low		
	Islamic	SRI	Green	Islamic	SRI	Green	Islamic	SRI	Green
Sharpe ratio	0.3827	0.5449	0.5746	0.1762	0.3420	0.1854	0.0408	0.3594	0.5338
							0.0000	0.0000	0.0000
Modified Sharpe ratio	0.7178	0.8604	0.9387	0.4590	0.4052	0.3377	0.3127	0.5227	0.6260
							0.0000	0.0000	0.0000
Adjusted Sharpe ratio	0.1255	0.0695	0.0408	0.0064	0.0742	0.0215	0.0513	0.0480	-0.0105
							0.0000	0.0000	0.0000
Treynor measure	0.3908	0.2122	0.1174	-1.3194	0.0559	0.0963	0.3350	0.1159	-0.2176
							0.0000	0.0000	0.0000
Infromation ratio	0.2362	0.4313	0.6623	0.0749	0.1849	0.2848	0.0513	0.1465	0.6111
							0.0000	0.0000	0.0000
Jensen's alpha	0.2815	0.4536	0.5801	0.0429	0.1418	0.3800	0.1397	0.0736	0.4404

Exhibit 17: Absolute and relative performance measures after double-sorting on fund characteristics (age, beta) for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015)
Source: Author's illustration

Results show that the Top 10th percentile funds outperform the Bottom 10th percentile funds in most cases. The only case in which this does not hold is for the Adjusted Sharpe ratio and Treynor measure for Green funds, for which the Bottom 10th Percentile outperforms the Top 10th Percentile. Moreover, looking at each percentile for itself shows that for the Top 10th percentile Green mutual equity funds are, on average, the best performers, which is consistent with the previous results in this thesis. Islamic mutual equity funds show better performance for the Top 10th percentile funds according to the Treynor measure; otherwise they exhibit, on average, the worst results amongst the three types of funds considered. SRI mutual equity funds remain, on average, middle performers amongst all three types of funds in the analysis. Results differ when looking at the Bottom 10th percentile. For the Bottom 10th percentile, there are more differences in the results and the clear best performer cannot be chosen. For example, Islamic mutual equity funds are the best performers looking at the Modified Sharpe ratio, however, seem to be worst performers looking at the Treynor measure. SRI mutual equity funds are clearly the best performers looking at the Sharpe ratio and Adjusted Sharpe ratio, while Green mutual equity funds prove the best results for the relative performance measures and Treynor measure.

T-test has been calculated in order to assess whether there is any statistical difference in the results. Once again, it has been confirmed that the results are not statistically significant and that it is not certain that the "real" difference in the performance exists, as all of the reported p-values are above the 5%. However, it is noteworthy to mention that the p-values for some of

the cases are close to the 5%. Results of the t-test for the Top 10th percentile funds are presented in Exhibit 23: T-test for Top 10th percentile after double-sorting on fund characteristics (age, beta) for relative performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) and in Exhibit 24: T-test for Top 10th percentile after double-sorting on fund characteristics (age, beta) for absolute performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) in Appendix. For the Bottom 10th percentile funds results are presented in Exhibit 25: T-test for Bottom 10th percentile after double-sorting on fund characteristics (age, beta) for relative performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) and in Exhibit 26: T-test for Bottom 10th percentile after double-sorting on fund characteristics (age, beta) for absolute performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) in Appendix

7. Conclusion, limitations and further recommendations

7.1. Conclusion

Islamic, SRI and Green mutual equity funds represent some of the fastest growing types of investments over the past two decades. Islamic mutual equity funds have grown at remarkable pace since 1994, when Shariah scholars started to accept equity investments. To call an investment Shariah compliant means that it meets several industries and financial ratio screens which are based on Islamic religious principles. SRI mutual equity funds have experienced rapid growth in recent years when investors started to consider Environmental, Social and Governance (ESG) principles in making investment decisions. Green mutual equity funds represent a subgroup of SRI mutual equity funds, where the investment focus is oriented towards environmental screening.

Since all three types of investments experience similar investment practices, it is interesting to observe whether they report any differences in their performance. Therefore, this thesis provides a comparative performance analysis of Islamic, SRI and Green mutual equity funds. The main findings of this paper may be of interest to several different stakeholders, namely institutional investors, such as pension funds, individual investors and mutual fund managers, as they might impact their portfolio making decisions.

Empirical findings are obtained by employing traditional performance risk-adjusted measures (Sharpe ratio, Modified Sharpe Ratio, Adjusted Sharpe Ratio and Treynor measure, Information ratio and Jensen's alpha) and calculating their average annualized values. Data consists of monthly Net Asset Values for 611 funds with open-end mutual equity orientation, retrieved from Bloomberg. All of the above measures were calculated for two sample periods, one for the entire observed period and one excluding 2001 (dot.com crisis) and 2007-2008 (recent financial crisis) to capture potential effects of the crises on the results.

The main empirical finding for the whole sample period was that for all measures, with the exception of Treynor ratio, the Green mutual equity funds were, on average, considered as the best performing funds. The Islamic mutual equity funds report, on average, the worst results for the four performance measures, and were only outperforming, on average, SRI mutual equity funds when Adjusted Sharpe ratio and Information ratio were used. The SRI mutual equity funds report the best performance amongst three mutual funds if one would evaluate

the performance based solely on the Treynor measure. These results might indicate that the Green mutual equity fund managers have the most skills (or luck) and are more persistent in delivering consistently good results compared to their Islamic and SRI counterparts.

Excluding the observations, which match the period of the financial crisis, led to slight changes in the results, smoothing them and increasing their values, as the majority of negative periods were not considered. Based on these results, Green mutual equity funds are still considered to be the best performers, however, now reporting the best results for only four measures, while for the remaining two, Treynor measure and Jensen's alpha, they are the worst performing funds. Islamic mutual equity funds report the worst results in three performance measures - Sharpe ratio, Modified Sharpe ratio and Information ratio. As for the remaining two measures, they report the middle result. SRI mutual equity funds are considered to be best performers according to Treynor measure and Jensen's alpha, however they report the worst results for the Adjusted Sharpe ratio. This might indicate that, even during the period of crises, The Green mutual equity funds report, on average, more consistent and higher ratios than the other two types of funds. Another important finding is that the exclusion of the financial crisis leads to achieving more uniform results, meaning that the differences between the reported ratios are narrower. Additionally, double-sorting on fund characteristics shows that Top 10^{th} percentile funds outperform, on average, the Bottom 10^{th} percentile funds.

All in all, Green mutual equity funds are considered to be the best performers, followed by SRI, and lastly, Islamic mutual equity funds. However, the differences in the reported results for the SRI and Islamic mutual funds are relatively small, especially for the sample period which excludes the crises periods. While there is an economic significance as presented in this thesis, there is no statistical significance as can be seen from t-test results. Thus, one could conclude that different types of investors, i.e. ones who are keen on allocating their assets in ethical and sustainable investments, might consider including Islamic mutual equity funds as a substitute, or as a complement to SRI mutual funds.

7.2. Limitations

One of the main limitations of this research is the lack of data, as it is rather challenging to find uniform data on this topic. For example, as far as the author of this paper is aware, Bloomberg is the only database allowing fund screening based on Islamic, SRI and Green

mutual equity funds across all regions and markets. Hence, it was not possible to cross check data with several other reliable databases, and thus, the aforementioned database serves as a foundation for the quantitative research.

Furthermore, as only traditional performance measures have been considered, it would be exciting to observe whether any differences arise if one tries to assess the performance using other measures. For instance, one performance measure that has gained popularity in recent years is mutual fund flows one. This measure considers fund inflows as outflows and as such a potential measure of their performance. It is interesting to observe as it is highly standardized and accepted amongst scholars. Moreover, the small sample size for the t-test is another limitation that can be overcome by using monthly performance measures as when computing t-test values.

7.3. Further recommendations

First, it is noteworthy that all the above-mentioned limitations might serve as recommendations for further research. Thus, upon availability of other data, it would be interesting to verify and enrich results from this research by levering on new data from other external sources. Additionally, expanding the research by employing several non-traditional performance measures would potentially add to this research by confirming or rejecting its results. Moreover, it would be interesting to see whether the results would differ if one uses monthly values of the performance measures to calculate t-values, and only annualizes them after confirming they are statistically significant or not.

Furthermore, potential research could include extension of the analysis to non-restrictive mutual equity funds, and therefore, compare the performance of the three types of funds analysed within this thesis with their conventional counterparts to see whether their performance is substantially different.

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Appendix

Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.332327652	0.362596777
Variance	0.760697342	1.21356772
Observations	15	15
Hypothesized Mean Difference	0	
df	27	
t Stat	-0.083433944	
P(T<=t) one-tail	0.467061011	
t Critical one-tail	1.703288446	
P(T<=t) two-tail	0.934122021	
t Critical two-tail	2.051830516	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.332327652	0.427998035
Variance	0.760697342	1.338892524
Observations	15	15
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.255714827	
P(T<=t) one-tail	0.400091642	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.800183284	
t Critical two-tail	2.055529439	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.362596777	0.427998035
Variance	1.21356772	1.338892524
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.158544886	
P(T<=t) one-tail	0.437582718	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.875165437	
t Critical two-tail	2.048407142	

Modified Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.65573089	0.698838419
Variance	0.253151138	0.455794042
Observations	15	15
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.198286173	
P(T<=t) one-tail	0.422181719	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.844363438	
t Critical two-tail	2.055529439	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.65573089	0.770454488
Variance	0.253151138	0.517299767
Observations	15	15
Hypothesized Mean Difference	0	
df	25	
t Stat	-0.506204385	
P(T<=t) one-tail	0.308574118	
t Critical one-tail	1.708140761	
P(T<=t) two-tail	0.617148236	
t Critical two-tail	2.059538553	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.65573089	0.698838419
Variance	0.253151138	0.455794042
Observations	15	15
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.198286173	
P(T<=t) one-tail	0.422181719	
t Critical one-tail	1.70561792	
P(T<=t) two-tail	0.844363438	
t Critical two-tail	2.055529439	

Adjusted Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.145306541	0.142671625
Variance	0.002200835	0.0025605
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	0.14789317	
P(T<=t) one-tail	0.441743483	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.883486966	
t Critical two-tail	2.048407142	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.145306541	0.154656479
Variance	0.002200835	0.002496499
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.528358432	
P(T<=t) one-tail	0.300706851	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.601413701	
t Critical two-tail	2.048407142	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.142671625	0.154656479
Variance	0.0025605	0.002496499
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.652727561	
P(T<=t) one-tail	0.259627798	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.519255596	
t Critical two-tail	2.048407142	

Treynor measure

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	-1.893700412	0.743446128
Variance	71.74825176	22.38751746
Observations	15	15
Hypothesized Mean Difference	0	
df	22	
t Stat	-1.052694987	
P(T<=t) one-tail	0.151953163	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	0.303906326	
t Critical two-tail	2.073873068	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.134291038	0.082824734
Variance	1.499860258	0.054079634
Observations	6	6
Hypothesized Mean Difference	0	
df	5	
t Stat	0.101130347	
P(T<=t) one-tail	0.461688577	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.923377153	
t Critical two-tail	2.570581836	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	2.231368404	0.082824734
Variance	46.9716948	0.054079634
Observations	6	6
Hypothesized Mean Difference	0	
df	5	
t Stat	0.767453078	
P(T<=t) one-tail	0.238734361	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.477468722	
t Critical two-tail	2.570581836	

Exhibit 18: T-test for relative performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015)

Source: Author's illustration

Information ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.301436358	0.275669489
Variance	0.107940183	0.229119628
Observations	15	15
Hypothesized Mean Difference	0	
df	25	
t Stat	0.171891256	
P(T<=t) one-tail	0.432453446	
t Critical one-tail	1.708140761	
P(T<=t) two-tail	0.864906892	
t Critical two-tail	2.059538553	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.24981655	0.463020751
Variance	0.023480182	0.268662335
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	-0.882030044	
P(T<=t) one-tail	0.209069663	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.418139325	
t Critical two-tail	2.570581836	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.523112416	0.463020751
Variance	0.278021668	0.268662335
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.181731852	
P(T<=t) one-tail	0.430156704	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.860313407	
t Critical two-tail	2.306004135	

Jensen's alpha

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.053492773	0.0470839
Variance	0.03117622	0.039080272
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	0.093644895	
P(T<=t) one-tail	0.463029067	
t Critical one-tail	1.701130934	
P(T<=t) two-tail	0.926058134	
t Critical two-tail	2.048407142	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.075317031	0.065371345
Variance	0.019963726	0.011847342
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.124689716	
P(T<=t) one-tail	0.451922721	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.903845442	
t Critical two-tail	2.306004135	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.075317031	0.027876199
Variance	0.019963726	0.003873675
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	0.687080861	
P(T<=t) one-tail	0.261297512	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.522595024	
t Critical two-tail	2.570581836	

Exhibit 19: T-test for absolute performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015)

Source: Author's illustration

Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.898253287	1.011928449
Variance	0.15632793	0.320804391
Observations	9	10
Hypothesized Mean Difference	0	
df	16	
t Stat	-0.511189022	
P(T<=t) one-tail	0.308100103	
t Critical one-tail	1.745883676	
P(T<=t) two-tail	0.616200206	
t Critical two-tail	2.119905299	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.898253287	1.011052
Variance	0.15632793	0.41442
Observations	9	11
Hypothesized Mean Difference	0	
df	17	
t Stat	-0.48078176	
P(T<=t) one-tail	0.318400407	
t Critical one-tail	1.739606726	
P(T<=t) two-tail	0.636800815	
t Critical two-tail	2.109815578	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	1.011928449	1.011052
Variance	0.320804391	0.41442
Observations	10	11
Hypothesized Mean Difference	0	
df	19	
t Stat	0.003318493	
P(T<=t) one-tail	0.498693413	
t Critical one-tail	1.729132812	
P(T<=t) two-tail	0.997386826	
t Critical two-tail	2.093024054	

Modified Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.711136276	0.972582179
Variance	0.223035924	0.328134756
Observations	14	11
Hypothesized Mean Difference	0	
df	19	
t Stat	-1.222169338	
P(T<=t) one-tail	0.118294843	
t Critical one-tail	1.729132812	
P(T<=t) two-tail	0.236589686	
t Critical two-tail	2.093024054	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.711136276	0.951679
Variance	0.223035924	0.465736
Observations	14	12
Hypothesized Mean Difference	0	
df	19	
t Stat	-1.028087465	
P(T<=t) one-tail	0.158409935	
t Critical one-tail	1.729132812	
P(T<=t) two-tail	0.316819869	
t Critical two-tail	2.093024054	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.972582179	0.951679
Variance	0.328134756	0.465736
Observations	11	12
Hypothesized Mean Difference	0	
df	21	
t Stat	0.079784055	
P(T<=t) one-tail	0.468582218	
t Critical one-tail	1.720742903	
P(T<=t) two-tail	0.937164437	
t Critical two-tail	2.079613845	

Exhibit 20: T-test for relative performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), excluding the negative periods

Source: Author's illustration

Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.47261	0.668427783
Variance	0.416909	0.913808715
Observations	12	12
Hypothesized Mean Difference	0	
df	19	
t Stat	-0.58803	
P(T<=t) one-tail	0.281718	
t Critical one-tail	1.729133	
P(T<=t) two-tail	0.563437	
t Critical two-tail	2.093024	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.47261	0.71480184
Variance	0.416909	1.132787734
Observations	12	12
Hypothesized Mean Difference	0	
df	18	
t Stat	-0.67395	
P(T<=t) one-tail	0.254453	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.508907	
t Critical two-tail	2.100922	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.668428	0.71480184
Variance	0.913809	1.132787734
Observations	12	12
Hypothesized Mean Difference	0	
df	22	
t Stat	-0.11229	
P(T<=t) one-tail	0.455805	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.91161	
t Critical two-tail	2.073873	

Modified Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.7109	0.865675144
Variance	0.204999	0.422148226
Observations	12	12
Hypothesized Mean Difference	0	
df	20	
t Stat	-0.67703	
P(T<=t) one-tail	0.253072	
t Critical one-tail	1.724718	
P(T<=t) two-tail	0.506144	
t Critical two-tail	2.085963	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.7109	0.943560893
Variance	0.204999	0.483041632
Observations	12	12
Hypothesized Mean Difference	0	
df	19	
t Stat	-0.97164	
P(T<=t) one-tail	0.171718	
t Critical one-tail	1.729133	
P(T<=t) two-tail	0.343436	
t Critical two-tail	2.093024	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.865675	0.943560893
Variance	0.422148	0.483041632
Observations	12	12
Hypothesized Mean Difference	0	
df	22	
t Stat	-0.28358	
P(T<=t) one-tail	0.389691	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.779382	
t Critical two-tail	2.073873	

Adjusted Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.138027	0.132716539
Variance	0.002244	0.001691937
Observations	12	12
Hypothesized Mean Difference	0	
df	22	
t Stat	0.293267	
P(T<=t) one-tail	0.386033	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.772066	
t Critical two-tail	2.073873	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.132717	0.145483523
Variance	0.001692	0.001692815
Observations	12	12
Hypothesized Mean Difference	0	
df	22	
t Stat	-0.76018	
P(T<=t) one-tail	0.227609	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.455218	
t Critical two-tail	2.073873	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.138027	0.145483523
Variance	0.002244	0.001692815
Observations	12	12
Hypothesized Mean Difference	0	
df	22	
t Stat	-0.41168	
P(T<=t) one-tail	0.34228	
t Critical one-tail	1.717144	
P(T<=t) two-tail	0.68456	
t Critical two-tail	2.073873	

Treynor measure

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.631947	1.5428914
Variance	1.5128	24.24278576
Observations	12	12
Hypothesized Mean Difference	0	
df	12	
t Stat	-0.62179	
P(T<=t) one-tail	0.272855	
t Critical one-tail	1.782288	
P(T<=t) two-tail	0.545709	
t Critical two-tail	2.178813	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.404042	0.053706629
Variance	1.329082	0.061240562
Observations	5	5
Hypothesized Mean Difference	0	
df	4	
t Stat	0.664373	
P(T<=t) one-tail	0.271397	
t Critical one-tail	2.131847	
P(T<=t) two-tail	0.542793	
t Critical two-tail	2.776445	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	2.60633	0.053706629
Variance	57.66015	0.061240562
Observations	5	5
Hypothesized Mean Difference	0	
df	4	
t Stat	0.751283	
P(T<=t) one-tail	0.247134	
t Critical one-tail	2.131847	
P(T<=t) two-tail	0.494268	
t Critical two-tail	2.776445	

Exhibit 21: T-test for relative performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), excluding the effects of financial crises

Source: Author's illustration

Information ratio

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.25632	0.332372297
Variance	0.091622	0.273899006
Observations	12	12
Hypothesized Mean Difference	0	
df	18	
t Stat	-0.43576	
P(T<=t) one-tail	0.334096	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.668192	
t Critical two-tail	2.100922	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.249817	0.463020751
Variance	0.02348	0.268662335
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	-0.88203	
P(T<=t) one-tail	0.20907	
t Critical one-tail	2.015048	
P(T<=t) two-tail	0.418139	
t Critical two-tail	2.570582	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.523112	0.463020751
Variance	0.278022	0.268662335
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.181732	
P(T<=t) one-tail	0.430157	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.860313	
t Critical two-tail	2.306004	

Jensen's alpha

t-Test: Two-Sample Assuming Unequal Variances (Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.080966	0.093799098
Variance	0.015193	0.024938905
Observations	12	12
Hypothesized Mean Difference	0	
df	21	
t Stat	-0.22191	
P(T<=t) one-tail	0.413264	
t Critical one-tail	1.720743	
P(T<=t) two-tail	0.826529	
t Critical two-tail	2.079614	

t-Test: Two-Sample Assuming Unequal Variances (Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.027876	0.075317031
Variance	0.003874	0.019963726
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	-0.68708	
P(T<=t) one-tail	0.261298	
t Critical one-tail	2.015048	
P(T<=t) two-tail	0.522595	
t Critical two-tail	2.570582	

t-Test: Two-Sample Assuming Unequal Variances (SRI and Green)

	Variable 1	*Variable 2*
Mean	0.065371	0.075317031
Variance	0.011847	0.019963726
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	-0.12469	
P(T<=t) one-tail	0.451923	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.903845	
t Critical two-tail	2.306004	

Exhibit 22: T-test for absolute performance measures for Islamic, SRI and Green mutual equity funds (2001 – 2015), excluding the effects of financial crises

Source: Author's illustrations

Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.382719	0.544854277
Variance	1.121737	1.44552092
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.39191	
P(T<=t) one-tail	0.349045	
t Critical one-tail	1.701131	
P(T<=t) two-tail	0.69809	
t Critical two-tail	2.048407	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.382719	0.574597993
Variance	1.121737	1.738220125
Observations	15	15
Hypothesized Mean Difference	0	
df	27	
t Stat	-0.43943	
P(T<=t) one-tail	0.331922	
t Critical one-tail	1.703288	
P(T<=t) two-tail	0.663844	
t Critical two-tail	2.051831	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.544854	0.574597993
Variance	1.445521	1.738220125
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.06456	
P(T<=t) one-tail	0.474491	
t Critical one-tail	1.701131	
P(T<=t) two-tail	0.948982	
t Critical two-tail	2.048407	

Modified Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.717847	0.860406305
Variance	0.351499	0.603072065
Observations	15	15
Hypothesized Mean Difference	0	
df	26	
t Stat	-0.56511	
P(T<=t) one-tail	0.28842	
t Critical one-tail	1.705618	
P(T<=t) two-tail	0.57684	
t Critical two-tail	2.055529	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.860406	0.93866113
Variance	0.603072	0.674285972
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.26816	
P(T<=t) one-tail	0.395269	
t Critical one-tail	1.701131	
P(T<=t) two-tail	0.790539	
t Critical two-tail	2.048407	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.717847	0.93866113
Variance	0.351499	0.674285972
Observations	15	15
Hypothesized Mean Difference	0	
df	25	
t Stat	-0.84439	
P(T<=t) one-tail	0.203229	
t Critical one-tail	1.708141	
P(T<=t) two-tail	0.406459	
t Critical two-tail	2.059539	

Adjusted Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.125521	0.069455067
Variance	0.132704	0.048859577
Observations	15	15
Hypothesized Mean Difference	0	
df	23	
t Stat	0.5096	
P(T<=t) one-tail	0.307594	
t Critical one-tail	1.713872	
P(T<=t) two-tail	0.615187	
t Critical two-tail	2.068658	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.125521	0.040766149
Variance	0.132704	0.011338177
Observations	15	15
Hypothesized Mean Difference	0	
df	16	
t Stat	0.864898	
P(T<=t) one-tail	0.199938	
t Critical one-tail	1.745884	
P(T<=t) two-tail	0.399877	
t Critical two-tail	2.119905	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.069455	0.040766149
Variance	0.04886	0.011338177
Observations	15	15
Hypothesized Mean Difference	0	
df	20	
t Stat	0.452866	
P(T<=t) one-tail	0.32776	
t Critical one-tail	1.724718	
P(T<=t) two-tail	0.65552	
t Critical two-tail	2.085963	

Treynor measure

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	-0.98345	0.117405832
Variance	3.531002	0.076268774
Observations	6	6
Hypothesized Mean Difference	0	
df	5	
t Stat	-1.41977	
P(T<=t) one-tail	0.107453	
t Critical one-tail	2.015048	
P(T<=t) two-tail	0.214905	
t Critical two-tail	2.570582	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.390847	0.212170422
Variance	6.734933	68.76952101
Observations	15	15
Hypothesized Mean Difference	0	
df	17	
t Stat	0.079639	
P(T<=t) one-tail	0.468727	
t Critical one-tail	1.739607	
P(T<=t) two-tail	0.937454	
t Critical two-tail	2.109816	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	-0.98726	0.117405832
Variance	6.309336	0.076268774
Observations	6	6
Hypothesized Mean Difference	0	
df	5	
t Stat	-1.0708	
P(T<=t) one-tail	0.166602	
t Critical one-tail	2.015048	
P(T<=t) two-tail	0.333203	
t Critical two-tail	2.570582	

Exhibit 23: T-test for Top 10^{th} percentile after double-sorting on fund characteristics (age, beta) for relative performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015)
Source: Author's illustration

Information ratio

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.236162	0.43134067
Variance	0.200097	0.304483
Observations	15	15
Hypothesized Mean Difference	0	
df	27	
t Stat	-1.06417	
P(T<=t) one-tail	0.148337	
t Critical one-tail	1.703288	
P(T<=t) two-tail	0.296675	
t Critical two-tail	2.051831	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.146281	0.662338659
Variance	0.096383	0.553360904
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	-1.43157	
P(T<=t) one-tail	0.105843	
t Critical one-tail	2.015048	
P(T<=t) two-tail	0.211686	
t Critical two-tail	2.570582	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.759362	0.662338659
Variance	0.489544	0.553360904
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.212441	
P(T<=t) one-tail	0.418538	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.837076	
t Critical two-tail	2.306004	

Jensen's alpha

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.269718	0.580111987
Variance	0.416968	1.209075487
Observations	5	5
Hypothesized Mean Difference	0	
df	6	
t Stat	-0.54429	
P(T<=t) one-tail	0.30293	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.60586	
t Critical two-tail	2.446912	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.281494	0.45364249
Variance	1.509111	1.252823984
Observations	15	15
Hypothesized Mean Difference	0	
df	28	
t Stat	-0.40118	
P(T<=t) one-tail	0.345665	
t Critical one-tail	1.701131	
P(T<=t) two-tail	0.691331	
t Critical two-tail	2.048407	

t-Test: Two-Sample Assuming Unequal Variances (Top 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.612915	0.580111987
Variance	1.168327	1.209075487
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.047572	
P(T<=t) one-tail	0.481612	
t Critical one-tail	1.859548	
P(T<=t) two-tail	0.963223	
t Critical two-tail	2.306004	

Exhibit 24: T-test for Top 10^{th} percentile after double-sorting on fund characteristics (age, beta) for absolute performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015)
Source: Author's illustration

Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.176240235	0.185446986
Variance	0.343220451	0.171323642
Observations	3	10
Hypothesized Mean Difference	0	
df	3	
t Stat	-0.025385097	
P(T<=t) one-tail	0.490670978	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.981341955	
t Critical two-tail	3.182446305	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.176240235	0.341956117
Variance	0.343220451	0.311324748
Observations	3	8
Hypothesized Mean Difference	0	
df	3	
t Stat	-0.423215256	
P(T<=t) one-tail	0.350322756	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.700645513	
t Critical two-tail	3.182446305	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.341956117	0.185446986
Variance	0.311324748	0.171323642
Observations	8	10
Hypothesized Mean Difference	0	
df	13	
t Stat	0.661088779	
P(T<=t) one-tail	0.260050044	
t Critical one-tail	1.770933396	
P(T<=t) two-tail	0.520100087	
t Critical two-tail	2.160368656	

Modified Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.459041062	0.405172379
Variance	0.086061713	0.295248922
Observations	3	8
Hypothesized Mean Difference	0	
df	7	
t Stat	0.210332527	
P(T<=t) one-tail	0.41969972	
t Critical one-tail	1.894578605	
P(T<=t) two-tail	0.839399441	
t Critical two-tail	2.364624252	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.459041062	0.337733697
Variance	0.086061713	0.181374485
Observations	3	8
Hypothesized Mean Difference	0	
df	5	
t Stat	0.535277125	
P(T<=t) one-tail	0.30769966	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.61539932	
t Critical two-tail	2.570581836	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.405172379	0.337733697
Variance	0.295248922	0.181374485
Observations	8	8
Hypothesized Mean Difference	0	
df	13	
t Stat	0.276290774	
P(T<=t) one-tail	0.393334207	
t Critical one-tail	1.770933396	
P(T<=t) two-tail	0.786668413	
t Critical two-tail	2.160368656	

Adjusted Sharpe ratio

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.006357691	0.074246574
Variance	0.003392696	0.00158361
Observations	3	4
Hypothesized Mean Difference	0	
df	3	
t Stat	-1.737430351	
P(T<=t) one-tail	0.090352273	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.180704545	
t Critical two-tail	3.182446305	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.006357691	0.021474118
Variance	0.003392696	0.003146343
Observations	3	6
Hypothesized Mean Difference	0	
df	4	
t Stat	-0.37154568	
P(T<=t) one-tail	0.364537411	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.729074822	
t Critical two-tail	2.776445105	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.074246574	0.021474118
Variance	0.00158361	0.003146343
Observations	4	6
Hypothesized Mean Difference	0	
df	8	
t Stat	1.739579285	
P(T<=t) one-tail	0.060060581	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.120121161	
t Critical two-tail	2.306004135	

Treynor measure

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	-1.319360854	0.104765635
Variance	5.206384134	0.133036139
Observations	3	8
Hypothesized Mean Difference	0	
df	2	
t Stat	-1.075895889	
P(T<=t) one-tail	0.197263351	
t Critical one-tail	2.91998558	
P(T<=t) two-tail	0.394526702	
t Critical two-tail	4.30265273	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	-1.319360854	0.096268733
Variance	5.206384134	0.050496031
Observations	3	6
Hypothesized Mean Difference	0	
df	2	
t Stat	-1.071992282	
P(T<=t) one-tail	0.19796047	
t Critical one-tail	2.91998558	
P(T<=t) two-tail	0.39592094	
t Critical two-tail	4.30265273	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.16572899	0.096268733
Variance	0.163541061	0.050496031
Observations	6	6
Hypothesized Mean Difference	0	
df	8	
t Stat	0.367762539	
P(T<=t) one-tail	0.361294978	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.722589955	
t Critical two-tail	2.306004135	

Exhibit 25: T-test for Bottom 10^{th} percentile after double-sorting on fund characteristics (age, beta) for absolute performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015) Source: Author's illustration

Information ratio

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.374534417	0.284837119
Variance	0.066138934	0.108236156
Observations	3	5
Hypothesized Mean Difference	0	
df	5	
t Stat	0.429112071	
P(T<=t) one-tail	0.34285118	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.685702361	
t Critical two-tail	2.570581836	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.544885102	0.284837119
Variance	1.306898487	0.108236156
Observations	5	5
Hypothesized Mean Difference	0	
df	5	
t Stat	0.488809469	
P(T<=t) one-tail	0.322830696	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.645661393	
t Critical two-tail	2.570581836	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.374534417	0.346693141
Variance	0.066138934	0.821842357
Observations	3	8
Hypothesized Mean Difference	0	
df	9	
t Stat	0.078817481	
P(T<=t) one-tail	0.469451206	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	0.938902412	
t Critical two-tail	2.262157163	

Jensen's alpha

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and SRI)

	Variable 1	*Variable 2*
Mean	0.21474511	0.265852285
Variance	0.364106195	0.208261127
Observations	3	8
Hypothesized Mean Difference	0	
df	3	
t Stat	-0.133116262	
P(T<=t) one-tail	0.451264418	
t Critical one-tail	2.353363435	
P(T<=t) two-tail	0.902528835	
t Critical two-tail	3.182446305	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - SRI and Green)

	Variable 1	*Variable 2*
Mean	0.413896583	0.3799956
Variance	0.287032524	0.337321527
Observations	5	5
Hypothesized Mean Difference	0	
df	8	
t Stat	0.095936047	
P(T<=t) one-tail	0.462965524	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.925931048	
t Critical two-tail	2.306004135	

t-Test: Two-Sample Assuming Unequal Variances (Bottom 10th percentile - Islamic and Green)

	Variable 1	*Variable 2*
Mean	0.21474511	0.3799956
Variance	0.364106195	0.337321527
Observations	3	5
Hypothesized Mean Difference	0	
df	4	
t Stat	-0.380280247	
P(T<=t) one-tail	0.361534262	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.723068524	
t Critical two-tail	2.776445105	

Exhibit 26: T-test for Bottom 10^{th} percentile after double-sorting on fund characteristics (age, beta) for absolute performance measures for Islamic, SRI and Green Mutual Equity Funds (2001 – 2015)
Source: Author's illustration